Entrepreneurial behaviour of academics within the context of education

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2018

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This research investigates the entrepreneurial behaviour of academics. Nowadays, universities are expected to be organisations with open boundaries, allowing for the cooperation and interdependency among different actors in the society. Against this background, this research focuses on the engagement of academics on entrepreneurial activities with external actors, so as to introduce novelties in teaching to create value for the university.

Social capital theory on entrepreneurship explains how social structures facilitate and constrain opportunities, behaviours, and cognitions of social actors. However, we know less about the actions of individuals to organize their social network in the first place. This research contributes to this theory by focusing on the individual characteristics, such as networking practices of academics, as antecedents of social capital organisation.

Additionally, this research provides societal contribution by accomplishing a better understanding of the possible synergies between the three core tasks of the university (teaching, research and knowledge transfer). This research follows a sequential mixed methods approach grounded in critical realism. Four studies are conducted to understand:

How do the social interactions of academics affect their entrepreneurial behaviour within the context of UBC-based education, and (if any) with what effects on the education mission of the university?

FH MÜNSTER
University of Applied Sciences

VU VRIJE UNIVERSITEIT AMSTERDAM

Science Marketing
Science-to-Business Marketing Research Centre

ENTREPRENEURIAL BEHAVIOR OF ACADEMICS WITHIN THE CONTEXT OF EDUCATION

Sue Rossano-Rivero

ENTREPRENEURIAL BEHAVIOR OF ACADEMICS WITHIN THE CONTEXT OF EDUCATION

Sue Rossano-Rivero

INVITATION

to PhD Defense entitled

ENTREPRENEURIAL BEHAVIOUR OF ACADEMICS WITHIN THE CONTEXT OF EDUCATION

Wednesday, September
the 12th, 2018
at 11:45
in Aula of Vrije
Universiteit Amsterdam
De Boelelaan 1105, 1081
HV Amsterdam

The reception after the ceremony will take place in (EZ) HG-02C00 Gallery
Starting from 13:00 hrs.

Sue Rossano-Rivero

Entrepreneurial behaviour of academics within the context of education

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ISBN/EAN 978-94-9301-415-2

Cover design and picture: Luiza Leorato de Araujo, 2018; Sapucaia do Sul, Brazil.

Printed by Glideprint Enschede

VRIJE UNIVERSITEIT

ENTREPRENEURIAL BEHAVIOUR OF ACADEMICS WITHIN THE CONTEXT OF EDUCATION

ACADEMISCH PROEFSCHRIFT

ter verkrijging van de graad Doctor
aan de Vrije Universiteit Amsterdam,
op gezag van de rector magnificus
prof.dr. V. Subramaniam,
in het openbaar te verdedigen
ten overstaan van de promotiecommissie
van de Faculteit der Sociale Wetenschappen
op woensdag 12 september 2018 om 11.45 uur
in de aula van de universiteit,
De Boelelaan 1105

door
Sue Rossano-Rivero
geboren te México City, México

promotoren:	prof.dr. P.C. van der Sijde
	prof.dr. habil. T. Baaken
copromotor:	dr. I.A.M. Wakkee

Account and funding

This research project received funding from several organisations and research partners. These are the German State Ministry of Foreign Affairs (Auswärtiges Amt) who awarded a STIBET (Stipendien- und Betreuungsprogramm) scholarship of the DAAD (German Academic Exchange Service) for 2014 and 2015, the Faculty of Economics, Münster University of Applied Sciences, Germany (MUAS) and the Science-to-Business Marketing Research Centre at MUAS. The project developed scientific, professional and societal contributions mentioned below.

Academic contributions

This dissertation contains four empirical papers representing chapter three through six. These chapters are based on three co-authored and one single-authored paper and have been either published or on the process to submitted to peer-reviewed journals. Therefore, in co-authored empirical papers of this dissertation the we-form is used

Study 1

Davey, T., Rossano, S., & van der Sijde, P. (2016). Does context matter in academic entrepreneurship? The role of barriers and drivers in the regional and national context. *The Journal of Technology Transfer*, 41(6), 1457-1482

Study 2

Rossano, S. (2018). The role of the networking competency of the academic entrepreneur in University-Business Cooperation-based education: An integration of social capital and social cognitive theories. To be submitted to *International Journal of Higher Education*

Study 3

Rossano-Rivero, S., & Wakkee, I.A.M. (2018). Academic entrepreneurship in the context of education: the role of the networking behaviour of academics. *Journal of Science and Technology Policy Management,* https://doi.org/10.1108/JSTPM-03-2018-0034.

Study 4

Rossano, S., Meerman, A., Kesting, T., & Baaken, T. (2016). The Relevance of Problem-based Learning for Policy Development in University-Business Cooperation. *European Journal of Education*, 51(1), 40–55.

Acknowledgments

My Dad used to say: *"Sue, you must always feel like a champion before even reaching the goal. With such an attitude, you are preparing yourself for the victory"*. He knew of my many doubts I had during my career as a tennis player. You never know how things are going to come together. It is through playing tennis that I met my husband, and he is the reason why I am here today. Who would have thought that the "victory" from playing tennis would be "this moment I live today"?

Writing a PhD was no different to preparing for a tennis championship. As a tennis player, it took me four years of training, competing, winning and losing, to be a National Champion. That day, I will never forget. I finished the match, ran to my parents, and full of tears we kept saying: "*We made it! We made it!"*

Today I also say: "*Yes! We made it!"*

Much like playing tennis, it would seem that doing a PhD is an individual achievement. However, I was never alone in this journey. I am grateful to the many people who believed in me and gave so much of themselves to help me achieve this goal.

First and foremost, I would like to convey my sincere gratitude to my supervisors Prof. Dr. Peter van der Sijde, Prof. Dr. habil. Thomas Baaken and Dr. Ingrid Wakkee, for invaluable guidance, patience, advice and encouragement throughout my PhD.

I found the opportunity to do my PhD thanks to Prof. Thomas Baaken, whose wisdom and generosity changed the course of my life. Prof. Baaken has a true gift for seeing the potential in ideas and people, and is uniquely skilled and passionate in connecting people to bring ideas to life. It was thanks to him that I got to meet my first supervisor Prof. Peter van der Sijde and my co-supervisor Dr. Ingrid Wakkee. Prof. Baaken not only shared his wisdom and experience as my supervisor, but also inspired me to write about academic entrepreneurs. Along the way, Prof. Baaken has become more than my supervisor. He has become my mentor and a true promoter and supporter of my professional dreams. Johann Wolfgang von Goethe *said "…When we treat man as if he already were what he potentially could be, we make him what he should be"*. Prof. Baaken has always seen *"what I potentially could be"*. He started trusting me with important projects and tasks; he raised the bar for me to never let me go back to where I was. I thank Prof. Baaken deeply for opening the doors of the Science-to-Business Marketing Research Centre (S2BMRC). It would be impossible to count all the ways that he has helped me in my career. *"Prof. Baaken, thank you for opening my eyes to new opportunities and strength. I will forever be grateful for your guidance and kindness"*.

When I began studying for my PhD, I was graced by the opportunity to be mentored by Prof. Peter van der Sijde. Prof. van der Sijde embodies the very best qualities of the human condition and it is due to his depth of knowledge, commitment to students, patience, optimism and ability to explain complicated ideas simply and clearly, that I always felt motivated. I thank him for guiding me towards the right path and giving me the opportunity to be a doctoral student at the VU Amsterdam.

I benefit tremendously from having Dr. Ingrid Wakkee as my co-supervisor. Dr. Ingrid Wakkee has challenged me to think more deeply and encouraged me to reach more broadly in striving to undertake research that makes a difference. Dr. Wakkee sparked my curiosity and fascination for the theory behind entrepreneurship. She showed me that entrepreneurship is a major force behind new value creation, and that as academics we have the power and joy to create new value for others. She exemplifies the power of giving in developing others and it is she who has inspired me to pursue a career in academia and as an entrepreneur. I hope one

day to inspire others as she has inspired me.

I would like to thank the members of my PhD reading committee for the valuable roles they have played. Sincere thanks to Prof. Dr. Bart Bossink (VU University Amsterdam), Prof. Dr. Peter Groenewegen (VU University of Amsterdam), Prof. Dr. Jens Leker (WWU University of Münster), Prof. Dr. Gideon Maas (Coventry University) and Prof. Dr. Lorraine Uhlaner (EDHEC Business School).

I am deeply thankful to my institution, Münster University of Applied Sciences (MUAS), for their commitment to supporting doctoral candidates in MUAS and granting all the resources needed for the realisation of this PhD project.

They say it takes an army to write a book, and my dissertation was no exception. I feel very lucky to have worked with the army of creative academics in the S2BMRC, who were always willing to exchange ideas about my PhD and provided sage advice about my work. I am especially grateful to Prof. Dr. Todd Davey, who invited me to write my first publication and always shared his passion for entrepreneurship. For sharing his wisdom, knowledge and experience on statistics and quantitative methods, I thank my colleague and friend David Serbin, who is above all a team player, always willing to help. For the many projects together, endless support, beers together and talks about our PhD, I thank my friend and colleague Balzhan Orazbayeva. For the endless support and guidance in finding my way with the formalities of the university, when I could not speak a word of German, and for her unconditional friendship, I sincerely thank Denise Becker.

Special thanks go to my co-authors Arno Meerman and Dr. Tobias Kesting. Arno has opened up countless opportunities for our team to work on meaningful projects, such as the *Study on the cooperation between Higher Education Institutions and Public and Private Organisations in Europe* and the *University-business cooperation in Europe: drivers, challenges, and opportunities project*. Both projects provided the data for the realisation of studies 1 and 2. I sincerely thank him for giving so much to the team. Dr. Tobias Kesting provided me with valuable advice on academic writing. His passion for good academic research provided the data for study 4 of this dissertation.

To my colleagues and friends Dr. Lizette Hueso-Ponce and Prof. Dr. Jose Manuel Saiz-Álvarez, a sincere word of appreciation for supporting the realisation of the Mexican case-studies that set the foundation for study 3 of this dissertation. They brought me back to my country to confirm once again that México is a land with entrepreneurial spirit.

The year 2017 is one I will never forget. As I was involved in this PhD project, the most beautiful project of my life was also happening. I became a mother - I was blessed with the birth of my son Yannick on the 1st of March. He came to make me the happiest woman on earth. Ever since I knew I was pregnant, I couldn't but imagine him by my side at the end of my dissertation. His innocence, natural curiosity and ever charming smile has inspired me to spend less time learning and more time unlearning. He has inspired me to conform less in the hopes of doing something to create a better world for him. *"Mi niño hermoso, thank you for choosing me as your mother"*.

As a PhD student and mother I needed more than academic advice to get through this challenge. Nevertheless, I had perfect role models who guided me in this respect, starting with my sister Caro Rossano-Rivero. *Thank you sister for being my best friend and a woman to emulate*. I sincerely thank Prof. Dr. Carolin Plewa, who not only has always provided me with valuable advice on my academic work, but also stepped in with sage advice on motherhood, replying to my e-mails with words like *"…don't ever forget that Yannick needs you to be happy and healthy…"* To the many women that are working and raising families, I

thank you all for being "out there" and setting wonderful examples for upcoming generations.

Writing my PhD at the same time as becoming a mother took the endless support of my German family. I will always be thankful to my sister in-law, Vanessa Broek, my wonderful nephews – Luis and Finn – and my Mother and Father in-law Ulrike and Hermann Broek, for loving my son Yannick and playing with him whenever I needed to get some writing done. For a Mexican woman, living far away from her family, it is not easy. Nevertheless, the *Broek-Family* has received me and treated me as a daughter. I have learned to celebrate my achievements with them and crying on their shoulders in the face of the most unfortunate events; I love you all for accepting me in your family. Words cannot express my gratitude.

The boundless support of my family has been the foundation of my life. My deepest gratitude and love goes to my sister Caro and my brothers Seth and Sergio. My sister has been a role model for me. A working mother of three kids was always the proof I needed that I too, could pursue my dissertation with my Yannick. She and my brother-in-law Jesús, have brought great joy to our family with their three children - Said, Asdrubal and Karol, who I thank for the many times they have made me smile. I dedicate this effort to them, in the hopes that it will inspire them to always believe in their dreams and never underestimate the value of sports and education. I thank my brother, Dr. Seth Rossano-Rivero, for always being there for me and bringing "*music"* to the family, and to my brother Sergio for his unconditional love and support.

Above all, I thank my exceptional mother, whose strength and wisdom has always guided me. It is because of her that I learned to stand up "again" and "again". It is through her strength, integrity and generosity as a human being, that I have always live in a "happy world". She has always been the balance in my life and has always reminded me of the most important things in life. I thank God that I have her by my side to celebrate this achievement. "*Mami*, *thanks for being a great example in my life."*

Most of all, I could not have written my dissertation with out the support of my lovely husband, Marius Broek. He is the man for whom I am in Germany. Who would have thought that after meeting each other on the tennis courts, we would be here today? I followed him in the hopes of a *"happily-ever-after-story"*. I definitely made the right decision. *"It is great to be loved, but it is profound to be understood"*. Marius understands me like no one does. Over the last 12 years he has been my best friend, the love of my life and an unparalleled father for our son. He has always supported my projects and dreams. Marius has made our house a "*lovely home*" and words cannot express how much I love him. Last year, when tragedy hit and I lost my Dad, Marius hugged me and cried holding our son and me tight. I found the strength I needed in him and Yannick. "*Marius, you and Yannick are the biggest joy and meaning in my life. I am incredibly proud of you both"*.

Finally, I want to send a word of thanks to heaven to my Dad who left me on July 14th, 2017.

"*All the happiness I live today is because of you. I am here because of your words: "… feel the champion… believe that you deserve it" I am here today because, since I was born, you devoted your life to make me happy. I will save our "Hug" until is time to be together. In the meantime receive this kiss I send you with my soul. I will always love you Papi"*.

With love and gratitude,

Sue Rossano-Rivero
Senden, Germany 30th of March, 2018

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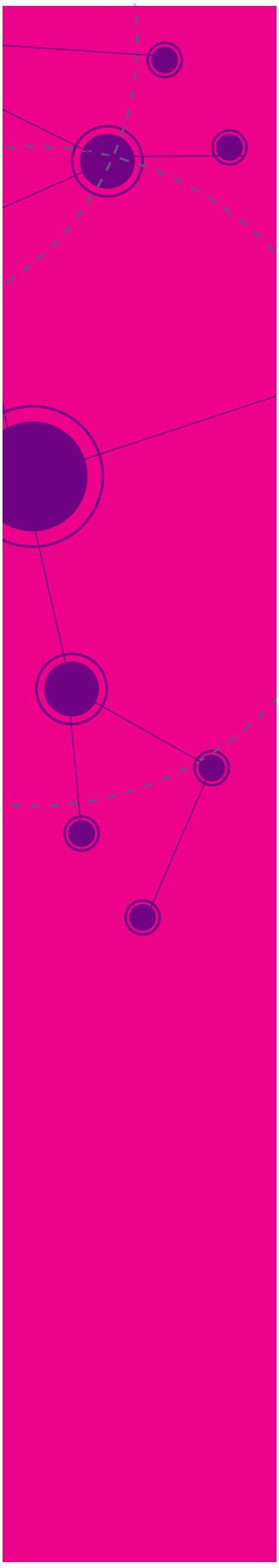
List of Abbreviations

BOP	Base of the Pyramid
DG	Directorate-General
EFC	Entrepreneurial Framework Conditions
ET2020	Education and Training 2020
EU	European Union
GCI	Global Competitiveness Index
GDP	Gross Domestic Product
GEM	Global Entrepreneurship Monitor
HEI	Higher Education Institution
IP	Intellectual Property
LLL	Lifelong Learning
MSC	Masters in Social Sciences
NICI	National Innovation Capacity Index
NIS	National Innovation Systems
NWC	Networking Competency
PBL	Project-based Learning
R&D	Research and Development
REL	Relational Social capital
RSI	Regional Systems of Innovation
RSQ	Research Sub-question
SME	Small and Medium Enterprises
TTO	Technology Transfer Office
UBC	University-Business Cooperation
UK	United Kingdom

Part A.

Introduction to the dissertation



Chapter 1 Introduction

This chapter presents the research background, research objectives and the research debates to which this dissertation contributes.

1.1 Research background

This dissertation is a study of entrepreneurial behaviour of academics. Nowadays, universities are expected to be organisations with open boundaries, allowing for the cooperation and interdependency among different actors in the society. Consequently, expectations regarding the role of academics in pursuing entrepreneurial activity in addition to their primary functions of carrying out teaching and research have increased in recent years (Loi & Di Guardo, 2015).

In a knowledge-based society, universities are to be regarded as the most relevant organisations (Etzkowitz, 2008). Many concepts such as "University-Business Cooperation (UBC)" and the "Entrepreneurial University" build on the assumption that industry-university-government all working in harmony have the potential to advance innovation and ultimately the economic and social wellbeing of people (Etzkowitz, 2008).

As a result, in recent years, universities have become increasingly involved in generating additional economic returns through bridging the gap between industry and the universities. With the increased significance of the entrepreneurial engagement of academics in UBC, a large body of higher education research has begun to use entrepreneurship frameworks (Mars & Rios-Aguilar, 2010). Hence, academic engagement in entrepreneurial endeavours has been conceptualised as "academic entrepreneurship"(Rothaermel, Agung, & Jiang, 2007).

Nevertheless, research on academic entrepreneurship has, to date, been carried out mainly from an economic perspective with special emphasis on the translation of outcomes from research activities into commercial applications through the development of patents, licences and spin-offs (Czarnitzki, Doherr, Hussinger, Schliessler, & Toole, 2016; Shane, 2004; Shane, Dolmans, Jankowski, Reymen, & Romme, 2015). There has been far less discussion of academic entrepreneurship in the context of educational activities and how these can lead to the creation of social value for the university, industry and society (D'Este & Perkmann, 2011; Spaapen & Drooge, 2011).

A more sociological approach to academic entrepreneurship has at the core the creation of value from the activities of academics in cooperation with non-academic organisations, such as business (Schoonhoven & Romanelli, 2009; Spaapen & Drooge, 2011; van der Sijde, 2012). This approach recognises how universities and business can exchange knowledge in diverse forms (Lamichhane & Sharma, 2010; Teixeira & Mota, 2012), such as through education-based collaborations with business (e.g. Caniëls & van den Bosch, 2011).

These collaborative activities of academics with business in education have proved to generate many benefits (Forsyth, Laxton, Moran, Banks, & Taylor, 2009; Plewa, Galán-Muros, & Davey, 2015) such as the enhancement of students' entrepreneurial skills (Baaken, Kiel, & Kliewe, 2015; Kiel, 2014). Hence, while often overlooked, the novelty and value-creating character of these activities justify, and in fact call for such activities to be regarded as instances of academic entrepreneurship (Goddard, 2007; Spaapen & Drooge, 2011).

Following Hasanefendic et al. (2016) such collaboration with external actors is inherent in the academics' engagement in entrepreneurial activities for the introduction of novelties in teaching; as such it requires distinct analytical and methodological approaches. Therefore, this study adopts a sociological perspective to understand *the entrepreneurial behaviour of academics within the context of UBC-based education*.

1.2 Entrepreneurship within the context of the university

The emergence of digital technologies that enabled and popularised massive open online courses (MOOCs) (Perna et al., 2014), and the fact that a considerable share of research and development activities is currently conducted in other organisations and (user) communities, (Drejer & Jorgensen, 2005) have positioned the universities in a competitive landscape. Hence, frequent and profound questions are being raised concerning the purposes and accomplishments of contemporary higher education and learning (Bensing & Van Oortwijn, 2006; Jentleson & Ratner, 2011).

In the view of prominent scholars (e.g. Clark, 2001, 2004; Etzkowitz, 1998; Gibb & Hannon, 2006) universities needed an "entrepreneurial response" to confront this competitive landscape and remain sustainable within this changing context. The entrepreneurial response from universities supposes an innovative approach along their core activities of (1) research and (2) teaching and learning. In this way, the universities would reconfigure themselves to best pursue opportunities beyond currently available means, but would keep the underlying values that characterise universities, combining the *"old"* and the *"new"* in a revised form of organisation (Clark, 2001, p.10). On the one hand universities and departments must adapt to changing external conditions and engage in market-oriented activities. But on the other hand universities must secure the position of basic research and the values and morals attached to this core function of university, which Clark (2001) calls "the academic heartland".

Entrepreneurship is an important engine for any organisation to push internally-centred growth into completely new opportunities unrelated to current mainstream activities, as well as to create new sources of wealth and value creation (O'Connor & Rice, 2013). The conception of the university as an entrepreneurial organisation has found increasing resonance among the international higher education community (e.g. Berger, 2008; Kesting, 2012). In the last decade, entrepreneurial modes of thinking and acting – understood as the mind-sets and processes with which activities are created and developed (European Commission, 2010, p.10)- have attracted increasing interest among knowledge managers and higher education policymakers. The interest in harnessing entrepreneurial behaviour within universities does not come as a surprise, given the growing external expectations on universities to better contribute to society and to play a more prominent role in shaping the knowledge society promoting economic growth (D'Este, Mahdi, Neely, & Rentocchini, 2012).

Universities are expected to take on the mission of transferring knowledge to society (Etzkowitz & Leydesdorff, 2000). Instead of an "ivory tower" of independent academics, nowadays the university is expected to be an organisation with open boundaries, allowing for the cooperation and interdependency among different actors in society (Bienkowska, Klofsten, & Rasmussen, 2016).

Perkmann et al. (2013) uses the term "academic engagement" as an umbrella term for all forms of cooperation between academics and non-academic actors (p. 424). Such collaborations include, networking with practitioners (Bonaccorsi & Piccaluga, 1994; D'Este & Patel, 2007; Meyer-Krahmer & Schmoch, 1998; Perkmann & Walsh, 2007), mobility for

students and staff, life-long learning efforts, collaborative research with the industry (Davey, Baaken, Galán-Muros, & Meerman, 2011; Davey, 2015), introduction of novelties in teaching with the participation of external actors to the university (Hasanefendic, Heitor, & Horta, 2016; Laredo, 2007), contract research and consulting (D'Este & Perkmann, 2011) and facility and data sharing (Wakkee, van der Sijde, Mashuri, & Sharp, 2015). In fact, previous studies find that these collaborations have stronger prevalence among academics than the formation of spin-offs and commercialisation of research via patents and licences (Perkmann et al., 2013).

Nowadays, definitions of the entrepreneurial university highlight the importance of collaboration and networking between the spheres of academia, industry, government and society as a whole to promote economic and social development, as well as innovation. Bienkowska et al., (2016) conceptualise the university as being a "permeable institution". This permeability of the university is grounded in the Triple Helix systems (Etzkowitz, 2008), emphasising boundary permeability among institutions as an important source of organisational creativity, which allows for the exchange of ideas within and among institutional spheres (Ranga & Etzkowitz, 2013). In this sense, the permeable university encourages interactions of students, academic faculty and external organisations that can evolve into networks of knowledge circulation to create new value for all actors involved (Van der Sijde, 2012).

For this reason, academics are nowadays considered to have a more prominent role in the creation of new social and economic value (Bozeman, Fay, & Slade, 2013; Perkmann et al., 2013), not only through the commercialisation of their research via patents, licences and start-ups, but also through their engagement in collaborations with other actors in order to create value for the students, the university and society as a whole.

In this context, academic entrepreneurship is understood as the engagement of academics in entrepreneurial activities with external actors so as to introduce novelties in teaching. While these academics might not be interested in leaving the university and taking on the role of a business owner, they are willing to champion ideas and introduce novelties to the university in order to create new value. These academics represent "intrapreneurial actors" within the university.

1.3 **The definition of academic entrepreneurship in this research**

Even though the idea of harnessing entrepreneurial behaviour among academics has been appearing in scientific literature for more than three decades (Rothaermel et al., 2007), there is still no general accepted definition, nor is there unanimity about how the concept should be understood. As a consequence, "entrepreneurialism" in academia has been a cause of controversy, with varying levels of acceptance and differing views on what actually constitutes an "entrepreneurial activity" (Audretsch, 2002).

Indeed, authors have used the term of "academic entrepreneurship" to represent a wider array of knowledge transfer activities, that does not only include the engagement in spin-off formation by academics (Göktepe-Hulten & Mahagaonkar, 2010). This broader definition has gained acceptance among the academic community as it has been recognised that academic entrepreneurship occurs in many modalities and mechanisms other than the literature has covered for (Benneworth & Jongbloed, 2010; Olmos-Peñuela, Castro-Martínez, & D'Este, 2014). For instance, Benneworth and Jongbloed (2010) and Perkmann et al., (2013) assert that academic entrepreneurship may entail a much broader spectrum of formal and informal activities, in which universities and academics interact and collaborate with a variety of

public and private actors in order to develop and implement scientific knowledge in and for practice. For example, Hasanefendic et al. (2016) have found that academics engage with external network contacts for the development and delivery of novel and entrepreneurial teaching formats.

Despite the lack of definition, there is broad consensus, both in the academic and practice fields, about the relevance and the need to bring entrepreneurship into the setting of the university (Davey, 2015; Rothaermel et al., 2007). Already, Schumpeter (1934), who stated that *"new enterprises are mostly founded by a new man and the old businesses sink into insignificance"*, identified the need to establish the logic of entrepreneurship within established organisations. Thereby, he associated entrepreneurship with innovation. Stemming from the Latin word *innovatio,* "innovation" means newness or difference, and to innovate means to make changes, introduce new things (Hornby, Wehmeier, & Ashby, 2002), or bring new methods and ideas or make a change (Soanes & Stevenson, 2004).

Throughout this research, the broader understanding of academic entrepreneurship is adopted, as it acknowledges the dynamism of the academic entrepreneur with respect to engaging in a wide range of knowledge-transfer activities. The selection of a definition for academic entrepreneurship in this research has been dependent upon the objectives of this thesis, a strategy that is often adopted and recommended in entrepreneurship literature (Gartner, 1990; Hébert & Link, 1989). On this basis, it was decided to select a definition better suited to addressing the main objective of this research – the investigation of the entrepreneurial behaviour of academics within the context of UBC-based education. Therefore, it was decided to define academic entrepreneurship with respect to the behavioural perspective on entrepreneurship, where it is defined as a process of opportunity pursuit, thus "Entrepreneurship" is defined as *"The process of recognising and pursuing opportunities for the purpose of creating new means-ends relationships* (Eckhardt & Shane, 2003, p.336; Shane & Venkataraman, 2000) *regardless of the location of the resources currently controlled* (Stevenson & Jarillo, 1990, p.23)*"*. This definition stresses that the essence of entrepreneurship is the willingness to pursue opportunity, regardless of the resources available, since the entrepreneur will always find "a way" to make it happen.

In the context of the university, this definition suggests that academic entrepreneurs enact themselves in order to acquire the necessary resources to realise opportunities. Particularly, in the university setting, academics are constrained in terms of resources. A classroom, a schedule and their own time are common resources for academics to execute their teaching tasks, however, academics need to enact themselves in order to make it happen, especially if they want to engage in innovation within the teaching mission of the university.

With this in mind, entrepreneurship as a process entails three sub-processes: opportunity recognition, opportunity development and opportunity exploitation (Van der Veen & Wakkee, 2006). The recognition of opportunities involves the development of initial ideas into more refined conceptualisations of new combinations. This entails the search for opportunities to create new value for the stakeholders of the university, namely the students, the industry, the markets, etc. Once ideas are refined, entrepreneurs must secure resources to realise their opportunities. This stage is entitled "opportunity development", and it requires the dynamic mobilisation of resources and stakeholders to create an organisational structure for "opportunity exploitation".

As shown in *Figure 1* the entrepreneur (academic entrepreneur) is the driver of this process. At the same time, the environment in which he or she is embedded is of critical importance to its success or failure. The environment of the academic entrepreneur is composed by

institutions and networks, which channel and direct, and stimulate or hinder the entrepreneurial process by providing access to ideas, resources, moral support and legitimacy (Aldrich & Zimmer, 1986).

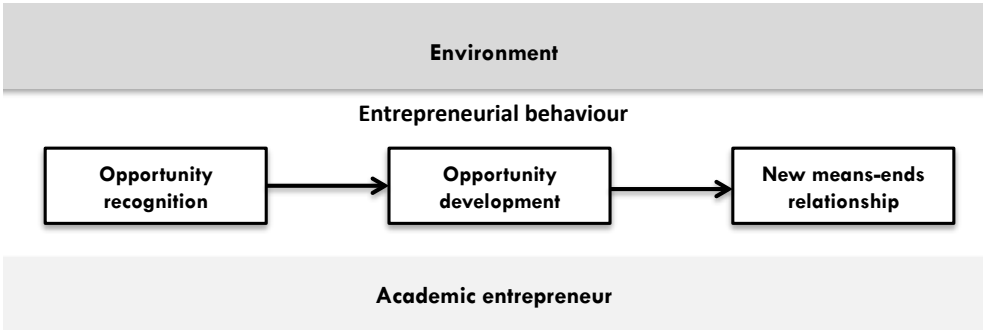


Figure 1. The entrepreneurial process (adapted from Van der Veen & Wakkee, 2006)

Academic entrepreneurship is then founded in the logic of pursuing entrepreneurial opportunities for new value creation within the context of the university. Hence, academic entrepreneurship is defined with respect to the definition of entrepreneurship that is given in the previous section. This definition does not limit academic entrepreneurship to spin-offs or independent firms founded by academics. It explicitly includes other outcomes, such as new services or new ways of working or teaching. This leads to the following definition of entrepreneurial behaviour from academics: *"The process by which an academic recognises and pursues opportunities for the purpose of creating new value for the university regardless of the location of the resources currently controlled"*.
This new value could be reflected in the introduction of novelties in teaching or the creation of new organisations, such as new units within the university. As such, academics collaborating with external actors create new ways of teaching, combining and exchanging resources in novel ways in order to co-create new value for their organisation.

1.4 Entrepreneurial behaviour of academics within the context of UBC-based education

Several studies have found that UBC has the potential to add value to the education mission of the university (e.g. Forsyth et al., 2009; Plewa et al., 2015). One of the greatest benefits from these partnerships is the development of students' skills and competencies, and consequently the enhancement of students' employability and entrepreneurial skills (Baaken et al., 2015; Kiel, 2014). Davey et al. (2011b) and Galan-Muros (2016) frame the UBC-based education domain as encompassing the following activities:

- **Joint curriculum design and delivery:** Understood as the joint development and supply of programmes or courses, modules, majors or minors, planned experiences as well as course delivery by delegates from external organisations within undergraduate, graduate or PhD programmes (Davey et al., 2011b).

- **Lifelong learning (LLL):** Generally defined as "learning through life" (UNESCO,

2014). Within the context of UBC, LLL is understood as the provision of adult education, permanent education and/or continuing education involving the acquisition of skills, knowledge attitudes and behaviours by people employed in external organisations.

- Student mobility: The most common manifestations are placements or internships in business (Lamichhane & Sharma, 2010); however it also includes PhD placements inside industrial labs (Henrekson & Rosenberg, 2001).

In this research, when I refer to UBC-based education, I focus on the teaching practices of academics (in their role of educators) when they execute them in cooperation with business. UBC-based education in this research is understood as the delivery of programmes, courses and content to students via a large range of mechanisms, such as guest lecturers from industry, UBC-based Project-based learning (PBL), placements and other (Davey et al., 2011b; Plewa et al., 2015).

Academics, in their role of educators, bring into the teaching environment real experiences from business and combine their pedagogical expertise to trigger the development of entrepreneurial behaviour among students (Täks, Tynjälä, Toding, Kukemelk, & Venesaar, 2014). From their side, external actors, such as businesses, acquire access to new knowledge (Teixeira & Mota, 2012) and new methods and tools to solve the real problems faced in their business environment, from the work done by the students and lecturers in the university. These novel combinations of resources and information, especially through new ways of exchanging and combining resources have been considered as sources of new value creation (Tsai & Ghoshal, 1998, p.468).

Under a sociological approach to academic entrepreneurship within the context of UBC-based education, academics engage in a knowledge circulation process (Van der Sijde, 2012), where not only the university transfers knowledge to external organisations, but also universities receive knowledge from the industry in order to improve teaching practices (Baaken et al., 2015; Hasanefendic et al., 2016; Plewa et al., 2015). To this end, the cooperation between academics and business does not only generate economic value, but also social value that can be reflected in new types of knowledge and new or different ways of working (Spaapen & Drooge, 2011), such as new ways of teaching. In this way the collaborative activities of academics with business have a positive impact on academic entrepreneurial activity.

The previous findings stress the importance of social capital for academics. However, social capital and networks are not borne out of nothing, and prominent scholars in the field of academic entrepreneurship and UBC still question how individuals within organisations initiate, build and maintain collaborations with other organisations (Perkmann et al., 2013). This call for research does not come as a surprise, given that UBC in general has been recognised as a people's game, driven by win-win relationships (Davey et al., 2011b).Therefore academics play a key role in the formation and management of their social capital. The question remains, however, as to how they are to achieve this. Which factors can affect their interactions with business? How do their social interactions relate to their entrepreneurial behaviour? More than that, what are the impacts of the entrepreneurial behaviour of academics within the context of education?

In summary, the previous findings have led to the main research question of this dissertation: *How do the social interactions of academics affect their entrepreneurial behaviour within the context of UBC-based education and (if any) with what effects on the education mission of the university?*

This is the basic question that I want to answer in the scope of this dissertation. Moreover, it is my personal goal, not only to answer that question and contribute to theory building, but also to improve teaching practices by providing empirical evidence on the effects of such novel teaching formats on the learning experience of the students.

1.5 **Research objective**

The main objective of this doctoral research is to relate the academics' social interactions with external actors of the university to their entrepreneurial behaviour within the context of their teaching practices. To do so, this study examines the entrepreneurial behaviour of academics within the context of UBC-based education from a "sociological perspective". Accordingly, this doctoral dissertation has set the following main research question:

How do the social interactions of academics affect their entrepreneurial behaviour within the context of UBC-based education, and (if any) with what effects on the education mission of the university?

To answer this question, four studies were conducted, under the following research sub-questions:

> *1. What roles do barriers and drivers for university-business cooperation have in academic entrepreneurship?*
>
> *2. To what extent does the networking competency of the academics affect their entrepreneurial engagements with external actors within the context of education?*
>
> *3. How does the networking behaviour of the academics affect their entrepreneurial engagements with external actors within the context of education?*
>
> *4. What are the effects on teaching of academics' entrepreneurial engagements with external actors?*

1.6 **Theoretical approach**

1.6.1 Sociological approach to academic entrepreneurship

The field of entrepreneurship research has been dominated by economic perspectives, which focus on the founding of new business and/or small business management. However, these perspectives do not entirely represent the scientific domain. According to Shane and Venkataraman (2000) the domain of entrepreneurship research involves the study of: (1) Why, when and how opportunities for the creation of goods and services emerge? ; (2) Why, when and how some people, and not others, discover and exploit these opportunities? ; and (3) Why, when and how different modes of action are used to pursue entrepreneurial opportunities? This study is rooted in the third set of questions, as it examines the process of how academic entrepreneurs seek to obtain necessary resources for entrepreneurial endeavours within the university.

The new sociological contribution defines entrepreneurship as a collective phenomenon, which recognises the actions and contributions of dynamic actors but simultaneously acknowledges the substantive impact of the larger social network and institutional community in which these actors are embedded, constraining or facilitating their behaviour. Besides the actions and strategies of individuals, entrepreneurship also depends on collective

action, where entrepreneurs draw upon local, regional, and/or professional communities (Schoonhoven & Romanelli, 2009).

In order to successfully introduce novelties in teaching, academics need not only good ideas, but also key resources, including legitimacy and contacts. Therefore, the pursuit of opportunities by academic entrepreneurs is performed within and through relationships with stakeholders in the social and institutional context. Hence, in this research the central notion of academic entrepreneurship is the creation of value from activities of academics achieved via the interaction with others (Spaapen & Drooge, 2011). To this end social capital theory on entrepreneurship is used as the main theory for this dissertation.

1.6.2 Social capital on entrepreneurship

The social capital theory has a prolific and established nature, offering a thorough foundation for this research by providing a comprehensive understanding of how entrepreneurial action is enabled by social interactions. Many scholars argue that social capital is well positioned to address the integrative theoretical needs of entrepreneurship scholars because it helps to explain processes and outcomes of social interactions at multiple levels of analysis and across a diverse set of situations and contexts (Gedajlovic, Honig, Moore, Payne, & Wright, 2013; Kim & Aldrich, 2005). Social capital theories on entrepreneurship explain how social structures facilitate and constrain opportunities, behaviours, and cognitions of social actors (Tindall & Wellman, 2001).

Social capital has been applied to examine various entrepreneurship-related constructs and variables related to entrepreneurial behaviour including entrepreneurial intent (Liao & Welsch, 2005) and creativity (e.g. Perry-Smith & Shalley, 2003). Such works confirm that the acquisition and management of social capital plays an essential role in the entrepreneurship success of individuals and collectives, including both new ventures and established organisations (Hitt et al., 2011).

Broadly defined, social capital constitutes *"the sum of the actual and potential resources embedded within, available through, and derived from the social contacts of an individual or an organization"* (Nahapiet & Ghoshal, 1998, p.243). Sociologists and organisational scholars identify three highly interrelated dimensions of social capital: the structural dimension, the cognitive dimension and the relational dimension (Granovetter, 1992; Nahapiet & Ghoshal, 1998)

The structural dimension refers to the overall pattern of connections between actors – that is, whom you reach (Burt, 2000). The relational dimension refers to the quality of those relationships between actors (Granovetter, 1992). It can be defined as the assets that are rooted in these relationships, such as trust. Finally, the cognitive dimension of social capital refers to the norms and values associated with the social network (e.g. Coleman, 1990; Portes & Sensenbrenner, 1993; Putnam, 1995). This dimension facilitates a common understanding of collective goals through a shared code or shared paradigm and proper ways of acting in a social system (Nahapiet & Ghoshal, 1998).

To date, there are competing social capital theories regarding the effectiveness of an entrepreneur's specific structural network configurations. Here, the reasoning is that success depends, in part, on being well connected (Vissa, 2011). These studies implicitly assume that individual entrepreneurs are non-strategic actors who do not intentionally pursue valuable new connections (Stuart & Sorenson, 2007). While theory and evidence on the effects of social capital on entrepreneurship are abundant, few studies have identified the underlying endogenous practices by which entrepreneurs attempt to organise their social capital in the

first place.

Filling the gap in our knowledge, this study focus on the networking practices of individuals that purposefully configure their network by assessing to which new people they would like to build a tie. Networking as practice can improve individuals' social capital by influencing (1) the size of their social networks, (2) the strength of their relationships within the social network, (3) the pattern of relationships in their social network, and (4) the resources of their social network (Forret, 2006).

Through this perspective, this research contributes to our understanding of the individual entrepreneur as an active strategic actor, instead of a passive and responsive one; dependent on the configuration of a certain network. Accordingly, this dissertation addresses the following theoretical debates listed in the next section.

1.7 **Theoretical debates**

This study aims at understanding the entrepreneurial behaviour of academics within the university from a sociological perspective. It engages with theories on social and economic value creation through the activities of entrepreneurial individuals. Within these traditions, the following debates are addressed:

1.7.1 Debate 1: Factors affecting entrepreneurship within universities

The first debate to which this dissertation will contribute is the research area aimed at understanding how entrepreneurship is influenced within the university setting (D'Este et al., 2012; Davey, 2015). The body of literature focusing on the individual asserts that personal characteristics and motivations determine entrepreneurial behaviour among academics. This stream of literature is mainly concerned with personal and professional attributes of academic entrepreneurs, such as age and position, gender, knowledge, skills and motivation (D'Este et al., 2012; D'Este & Patel, 2007; Lam, 2011). However, the isolated consideration of the individual ignores relevant organisational factors, such as organisational culture, availability of knowledge and resources, as well as cooperation with others.

In contrast, the stream of literature at the university level, asserts that the behaviour of academics is shaped by and subject to the institutional arrangements and structures of the university, such as technology transfer offices (TTOs), science parks and incubators, as well as supportive internal rules and procedures (Clarysse, Tartari, & Salter, 2011; Siegel, Waldman, & Link, 2000). Likewise, Davey (2015, p. 206) asserts that characteristics of the university, such as size, nature, experience when dealing with entrepreneurship and collaborative projects with business, as well as the degree of acceptance of entrepreneurship in the university, are important influencing factors at the organisational level.

In this research, a sociological perspective is used to explain how the entrepreneurial behaviour of academics is affected by their social context (e.g. networks). This context offers opportunities and set boundaries, and can thus be an asset and a liability for the nature and extent of entrepreneurship, but entrepreneurship can also impact contexts (Welter, 2011). Therefore, this view acknowledges the bidirectional relationship between the individual and their context.

As such, this research will contribute to this debate by considering academic entrepreneurs as actors embedded in their context. In doing so it will analyse how academics make use of their social ties in the pursuit of entrepreneurial opportunities within the university. This research hereby builds on the work of Carrasco et al. (2008), Forret and Dougherty (2004) and Vissa

(2011, 2012), and define this behaviour as the networking behaviour of the academics. In addition, it explores the behavioural and attitudinal factors explaining differences between academics (Clarysse et al., 2011; D'Este, Llopis, & Yegros, 2013; Perkmann et al., 2013) and the individual factors affecting academic entrepreneurship.

1.7.2 Debate 2: The extension of the intrapreneurship field to the context of the university

While the relevance of intrapreneurship is well recognised in industrial settings and private organisations (Kuratko, Hornsby, & Hayton, 2015) interesting avenues for further research call for the extension of the field of intrapreneurship to non-profit institutions (Fini, Grimaldi, Santoni, & Sobrero, 2011). The context of the university offers an opportunity to extend this field of research, as the universities explored in this research are non-profit institutions, and thus differ in many ways from those organisations that pursue commercial ends.

Entrepreneurs who discover opportunities for new ventures do not always control the resources nor possess the experience needed to pursue them. In the academic world this issue is particularly more evident. In this respect, academics could benefit from their social networks more than from their own organisation. Their social networks with external actors can, for example, provide them with advice, resources, experience and information about the outside world to exploit the results of their research or update their teaching curriculum, thus compensating for their traditional non-entrepreneurial orientation (Mustar et al., 2006; Vohora, Wright, & Lockett, 2004).

This research contributes to this debate by analysing how academics get the resources and knowledge they need for entrepreneurial endeavours within the university. In doing so, it brings the field of intrapreneurship to the university setting, thus extending this field of research to another context, as most of the literature has focused on private organisations and industrial settings.

1.7.3 Debate 3: A broader understanding of the concept of "Academic Entrepreneurship"

The third theoretical debate to which this dissertation contributes covers the concept of "academic entrepreneurship" itself. The literature defines academic entrepreneurship in many ways. Some authors regard it as a narrow concept associated with commercialisation and new business ventures (Shane, 2004; Shane et al., 2015; Wright, Clarysse, Mustar, & Lockett, 2007). In the narrow understanding of academic entrepreneurship, commercialisation of research plays a main role. Studies covered within the narrow understanding focus on aspects of opportunity recognition and individual economic incentives to transfer research to the market in the form of spin-offs and patents (Lach & Schankerman, 2008; Shane, 2004; Wright et al., 2007). These approaches consider entrepreneurial behaviour to be a one point in time intention (Fayolle, 2013), instead of a process of pursuing an entrepreneurial opportunity (Gartner, 1990; Shane & Venkataraman, 2000; Van der Veen & Wakkee, 2006).

By contrast, other authors use the concept in a broader sense to represent a wide variety of entrepreneurial activities performed by academics (D'Este & Perkmann, 2011; Davey et al., 2011; Perkmann et al., 2013). These activities include the engagement of academics in entrepreneurial activities with businesses, so as to introduce novelties in teaching with the participation of external actors (Laredo, 2007), contract research and consulting (D'Este & Perkmann, 2011), and facility and data sharing with external organisations, such as business and public organisations (Wakkee et al., 2013). With this understanding of academic entrepreneurship, collaboration and social interactions play an important role in transferring knowledge from the university to the productive sector and society as a whole (Perkmann et

al., 2013; Spaapen & Drooge, 2011).

An important characteristic of this broader perspective is the possibility to consider academic entrepreneurship as a process, where new value is created through the collaborative activities of academics; not only commercial value in the form of spin-offs, but also societal value for the students, the university, and all actors involved.

1.7.4 Debate 4. Effects of academics' entrepreneurial activities on the education mission of the university

The debate on academic entrepreneurship has not reached agreement on the effects of academics' engagement in entrepreneurial activities on traditional academic tasks (e.g. teaching and research). On the one hand, some studies argue that academic entrepreneurship can have a negative influence on teaching activities, since academics would face resource constraints when trying to balance their academic activities with their entrepreneurial ones (e.g Wright, Birley, & Mosey, 2004). On the other hand, De Silva (2012) found that additional benefits could arise as a result of interactions between different academic entrepreneurship activities. For example, academics that are experienced in collaborating with businesses are deemed to have a positive influence on education, since UBC contributes to producing graduates who are suited for careers in industry (Baldini, Grimaldi, & Sobrero, 2006). Similar to these findings, (Lin & Bozeman, 2006) observed that academics with industry exposure provide greater support to their students. Contributing to this debate, this research explores the possible synergies or discords between academics' entrepreneurial behaviour and their teaching, from both the academics' and the students' perspective.

1.8 **Societal relevance**

In a knowledge-based society, universities are expected to be the most relevant organisations. However, the growing societal relevance of the universities is linked to the expansion of collaborative activities from academics with private and public external organisations. The possible effects of these activities are like a two-edged sword.

On the one hand, positive benefits could arise as a result of interactions among academics and external actors. Academics who are experienced in collaborating with businesses and public organisations are deemed to produce graduates who are suited for careers in industry. Academics can also benefit from broadening their experience, knowledge, and contacts developed through academic entrepreneurship to improve traditional academic tasks (e.g. teaching and research). From society's perspective, academics' productive engagements with public organisations could be regarded a service in return for public funding.

On the other hand, academics intending to act as promoters of collaboration with external organisations will have to extend their orientation beyond teaching and research, and will have to balance their regular academic duties and their entrepreneurial engagements without sacrificing quality in higher education. A failure to meet this challenge may result in academics underperforming in teaching and/or research, due to a conflict in resources and interests.

Achieving a better understanding of the behaviour of academics and their entrepreneurial engagements is a promising way towards understanding the possible synergies between the three core tasks of the university (teaching, research and knowledge transfer). These synergies are aimed at providing direct benefits to academia, business, public organisations and society as a whole.

1.9 **Overview of the dissertation**

This dissertation has seven chapters. This chapter addresses the researcher's introduction and research objectives. It also clarifies the main concepts and definitions of this dissertation as well as the theoretical debates to which this dissertation contributes. In chapter two, the research design and methodological considerations are presented. Chapters three to six contain the four empirical papers resulting from this research. In chapter seven I once again address my research questions and discuss the theoretical and practical implications, as well as some limitations of the study and lines for further research avenues.

Table 1: Overview of the dissertation

Chapter	**Type of paper**	**Content**
Chapter 1	-	**Introduction** This chapter introduces the research background, research objectives and the research debates to which this dissertation contributes.
Chapter 2	-	**Research Design** Research design and methodological considerations
Chapter 3	Empirical	**Does context matter in academic entrepreneurship? The role of barriers and drivers in the regional and national context** ***Research question:*** What roles do barriers and drivers for university-business cooperation have in academic entrepreneurship? ***Aim:*** This chapter empirically investigates the influence of the conditions affecting the broader concept of University-Business Cooperation (UBC) on academic entrepreneurship across different regional settings in Europe. ***Contribution:*** This chapter provides contextualised explanations of how academics' entrepreneurial behaviour is subject to the broader conditions affecting UBC with "drivers for UBC" playing a larger role in the academics' entrepreneurial activity than "barriers for UBC". The results suggest that academic entrepreneurs and their value-creating activities are uniquely embedded in their context, not only at the university level, but also at the national and regional levels. ***Published:*** The Journal of Technology Transfer. ***Impact factor:*** 2.631

Chapter 4	Empirical	**The role of the networking competency of the academics in university-business cooperation within the context of education: An integration of social capital and social cognitive theories** ***Research question:*** To what extent does the networking competency of academics affect their entrepreneurial engagements with external actors within the context of education? ***Aim:*** This chapter empirically investigates the role of the networking competency of academics on the extent of development of UBC-based teaching. ***Contribution:*** This chapter provides an understanding on how academic's self-efficacy, in respect to their networking competency, mediates the relationship between relational aspects of UBC and the extent of development of UBC-based teaching. Entrepreneurial behaviour of academics is subject to a triadic, dynamic, and reciprocal interaction of personal factors and the environment.
Chapter 5	Empirical	**Academic entrepreneurship in the context of education: the role of the networking behaviour of academics** ***Research question:*** How does the networking behaviour of academics affect their entrepreneurial engagements with external actors within the context of education? ***Aim:*** This study empirically analyses the networking behaviour of academics through a composite construct, denominated their "networking behaviour". ***Contribution:*** Academic entrepreneurs as "entrepreneurial educators" make use of different networking mechanisms along the entrepreneurial process of forming and implementing their teaching practices in cooperation with external actors; however the networking actions implemented vary according to the stage in the entrepreneurial process. ***Published:*** Journal of Science and Technology Policy Management
Chapter 6	Empirical	**The relevance of problem-based learning for policy development in University-Business Cooperation** ***Research question:*** What are the effects on teaching of academics' entrepreneurial engagements with external actors? ***Aim:*** This study focuses on the effects of the entrepreneurial engagements of academics with business, on the learning experience from the perspective of the students. ***Contribution***: From the students' perspective, *"the acquisition of a more practical experience in a real-life project task" and " the concrete application of concepts in business practice"* are both

		the main motivators for students to participate in these UBC-based education projects and the main benefits perceived at the end of the course. ***Published:*** European Journal of Education. ***Impact factor:*** 0.906
Chapter 7	-	**Conclusion** This chapter presents the overall contribution of the thesis, the individual contributions of the research papers, as well as implications for theory and practice. Finally, a number of limitations and suggested lines for further research are presented.

Chapter 2 Research Design

The purpose of this chapter is to discuss the methodology adopted in this research. This research used a sequential mixed method design, meaning that the chapters of the dissertation build up on each other. Each of the four empirical chapters follows its own data collection strategy in order to best serve the purpose of the respective study and achieve a broader understanding of the entrepreneurial behaviour of academics.

The methodology was shaped by the philosophical stance of this research, which was critical realism. The following sections of the chapter initially justify the choice of this research philosophy, and subsequently, discuss the logic behind the approach to address each research sub-question, data collection and data analysis, together with methodological and philosophical justifications.

2.1 Research philosophy

The research philosophy adopted in a study, explains the nature and development of knowledge (Saunders et al., 2007). There is no widely accepted single best research philosophy; the selection of a research philosophy is made according to which is most suitable to accomplish the objectives of a research project (Ritchie & Lewis, 2003, Tashakkori & Teddlie, 1998). This study has used the type of data (e.g. qualitative data, quantitative data, or both) required to answer the research sub-questions as a basis for narrowing down the selection process to a more appropriate philosophy (Maxcy, 2003). The overview of the research sub-questions presented in *Table 2* suggests that this research needs both, the collection of quantitative and qualitative data in order to make sense of the phenomenon at hand – the understanding of the entrepreneurial behaviour of academics.

Table 2: Overview of the research questions and the research design approach

Research sub-question	Quantitative emphasis	Qualitative emphasis
RSQ1: What roles do barriers and drivers for university-business cooperation (UBC) have in academic entrepreneurship?	Study #1	
RSQ2: To what extent does the networking competency of the academics affect their entrepreneurial engagements with external actors within the context of education?	Study #2	
RSQ3: How does the networking behaviour of academics affect their entrepreneurial engagements with external actors within the context of education?		Study#3
RSQ4: What are the effects on teaching of academics' entrepreneurial engagements with external actors?	Study #4	

The main philosophies highlighted in the literature with respect to the use of quantitative methods, qualitative methods, or both are "positivism" (Pugh & Hickson, 1976), "social constructionism" (Ritchie & Lewis, 2003) and "pragmatism" (Howe, 1988) respectively. On the one hand, positivism is generally associated with quantitative methods, while social constructionism is most often equated with qualitative methods (Guba & Lincoln, 1994). On the other hand, pragmatism is considered to be associated with mixed methods, since it promotes the use of a combination of qualitative and quantitative methods that are best suited to answer specific research questions (Howe, 1988). Nevertheless, "critical realism" (Bhaskar, 2014) has also been used to underpin mixed method research designs, since its ontological perspective resembles the assumptions of positivism, while its epistemological stance (the way of gaining knowledge) is related to social constructionism (constructivism). Therefore, on the basis of the research needs, the selected research philosophies underpinning this study design are the critical realism assumption (Bhaskar, 2014) and pragmatism (Howe, 1988).

However, it is argued in the literature that pragmatism overrules purity (Rossman & Wilson, 1985) as the perceived benefits of mixing methods in "getting research done" came to be seen as outweighing the importance of the philosophical difficulties in their use (Miles & Huberman, 1994). This criticism has been mainly due to pragmatism allowing the combining of different incompatible philosophical perspectives that do not serve the purpose of triangulation, but sacrifice the strengths of one perspective for another (Blaikie, 1991). Thus, according to Miles and Huberman (1994, p.41): *"The question, then, is not whether the two sorts of data and associated methods can be linked during study design, but whether it should be done, how it will be done, and for what purposes."* Therefore, in an effort to balance pragmatic viewpoints and philosophical perspectives, Modell (2009) has illustrated how critical realism could be used to assess validity in mixed methods research, which overcomes the issues of pragmatism. Hence, critical realism is adopted as the main philosophical stance of this research. Its application and use is illustrated in the following sections.

The ontological perspective of critical realism states that the world is "real", and exists and acts at least partially independent of our knowledge of it (Sayer, 2000). In this respect, Bhaskar (2014) has illustrated three major ontological dimensions of reality, namely the "empirical", the "event" and the "real" domains. Empirical experience (empirical domain) is a result of actual events (event domain) generated by causal powers embedded in context-specific real mechanisms (real domain), where empirical experience represents only a portion of "actual events". In the same vein, the real mechanisms that generate events are complex and not simply unidirectional (Bhaskar, 2014).

Translating these concepts to the research design, it could be considered that empirical data about the entrepreneurial behaviour of academics within the context of education (e.g. academic engagement in teaching practices in collaboration with external actors), which is in the empirical domain, is a result of events that are generated by causal powers (e.g. causal factors found at the environmental level and at the individual level that influence academic entrepreneurial behaviour) in the "real" domain. These causal powers are complex, and specific to the context of the university. Therefore, based on this philosophical foundation, the following sections of the chapter illustrate the use of mixed methods approach in this research.

2.2 **The mixed methods design**

The term "mixed methods" has developed currency as an umbrella term applying to almost any situation where more than one methodological approach is used in combination with

another, usually, but not essentially, involving a combination of at least some elements drawn from each qualitative and quantitative approaches to research (Bazeley, 2008). Management research benefits from combining the complementary strengths of quantitative and qualitative approaches (Currall & Towler, 2003). This is because management research asks a large variety of questions, draws on numerous theoretical paradigms from a range of disciplines, and is characterized by investigations involving multiple levels of analysis (Bazeley, 2008).

Mixed methods are typically employed in applied settings where it is necessary to draw on multiple data sources to understand complex phenomena, and where there is little opportunity for experimentation (Bazeley, 2008). According to Bazeley (2008), multiple or mixed methods might be used when:

- **Complementary data are sought:** Either qualitative data to enhance understanding of quantitative findings, or quantitative data to help generalize or test qualitative insights. In this case, qualitative data gathered in study 3 is used to enhance the findings from quantitative data in study 1 and 2 with respect to the understanding of the context of academic entrepreneurs and with respect to their networking behaviour.

- **Different methods are appropriate for different elements of the project:** When each method contributes to an overall picture. In this case, each study in this dissertation pursues its own research strategy to answer each of the research sub-questions, which at the end contribute to the overall understanding of the main research question.

- **Data are sought from multiple independent sources:** To offset or counteract biases from each method, in order to confirm, validate or corroborate the results and conclusions of the study. In this case, study 3 builds on the findings of study 1 and 2 from a qualitative approach; corroborating the role of social interaction on the entrepreneurial behaviour of academics. In the same line, study 4 complements and confirms the perceptions of academics with respect to the benefits perceived by students from participating in UBC-based teaching practices.

In summary, the use of mixed methods has additional advantages, such as overcoming the weaknesses of using either qualitative or quantitative methods (Creswell, 2014). Qualitative research allows the researcher to focus on people's perceptions and to understand complex issues in depth and detail, while quantitative research serves to generalise research findings (Saunders, Lewis, & Thornhill, 2007). Accordingly, both methodologies are embodied in the case studies (qualitative) and surveys (quantitative) that are conducted in this research. The following paragraphs further explain the rationale behind the research approach along the mixed methods research design.

As outlined in Chapter 1, Section 1.3, the entrepreneurial behaviour of academics can be defined as *"The process of recognising and pursuing opportunities for the purpose of creating new means-ends relationships* (Eckhardt & Shane, 2003, p.336; Shane & Venkataraman, 2000) *regardless of the location of the resources currently controlled* (Stevenson & Jarillo, 1990, p.23)*"*. The academic as an entrepreneur plays a central role driving the entrepreneurial process. If successful, this process evolves beyond opportunity recognition, up to new value creation.

However, academics do not always personally control all the necessary resources to develop and exploit opportunities. They would often have to rely on having access to resources held by others. Therefore, for a broader understanding of the entrepreneurial behaviour of academics and their value-creating activities in interaction with others, two research issues need to be considered: (1) the role of the environment affecting the entrepreneurial behaviour of academics, as this provides them access to (or in some cases withholds) ideas, resources,

moral support and legitimacy throughout the entrepreneurial process and (2) the role of the individual driving the entrepreneurial process.

To address the aforementioned issues, this research approaches to the overall research question from a sociological perspective, considering that entrepreneurship is not merely an economic process, but rather that it draws from the social, spatial and institutional contexts that shape entrepreneurial behaviours, processes and outcomes (Jack & Anderson, 2002; Welter, 2011). Therefore, social capital has been the main parental theory used to address the question of how entrepreneurial behaviour is enabled by social interactions.

To this end, study 1 addresses the first research sub-question (RSQ1) of "*What roles do barriers and drivers for university-business cooperation (UBC) have in academic entrepreneurship?"* In order to understand the entrepreneurial behaviour of academics within the context of UBC, the first study of this dissertation investigates the role of inhibitors (barriers) and facilitators (drivers) for UBC in academic entrepreneurship. This study aims at understanding the role of the environment in the entrepreneurial behaviour of academics.

In order to gain a comprehensive view on academic entrepreneurship within the context of UBC, quantitative data was utilised from a robust research study undertaken in Europe in 2011 entitled "Study on the cooperation between Higher Education Institutions and Public and Private Organisations in Europe". This helped to obtain a broader understanding of the entrepreneurial interactions of academics with business and forms the basis for study 1.

As the first study researched the impact of the environmental factors on the more general concept of academic entrepreneurship, the second study focuses on UBC-based teaching as an instance of academic entrepreneurship. It aims at understanding individual aspects affecting the entrepreneurial behaviour of academics. It elaborates on the premises stated by entrepreneurship research that only the development of a variety of trusted and productive social linkages will play a role in developing an entrepreneurial idea and in garnering the necessary resources to create new value (Shane, 2000). Therefore, the academic entrepreneur can be a strategic actor in a position to select valuable new contacts (Stuart & Sorenson, 2007). To this end, it posits that not only the environment causes behaviour, but also behaviour causes the environment. Therefore, Study 2 draws from social cognitive theories, namely Social Cognitive Theory (Bandura, 1988, 1997) and Field Theory (Lewin, 1951).

Study 2 addresses the second research sub-question (RSQ2) of *"To what extent does the networking competency of the academics affect their entrepreneurial engagements with external actors within the context of education?"* At the personal level, the cognitive approach emphasises that perceptions (and motivations) affect everything we say or do as human beings. The relevance of perceptions (cognitive process) in shaping the individual's entrepreneurial decisions and actions has been stressed elsewhere (Baron, 2004; Krueger, Reilly, & Carsrud, 2000), not only at the individual level but also at the aggregate level (Arenius & Minniti, 2005). Therefore, Study 2 investigates the extent to which the networking competency of the academics affects their entrepreneurial engagements with external actors within the context of education.

Data for Study 2 was collected in the framework of a European project on the cooperation between higher education institutions and public and private organisations in 2016 entitled "University-business cooperation in Europe: drivers, challenges, and opportunities". For the aforementioned studies (study 1 and 2), an online questionnaire was created, translated into 33 languages, sent via email to all academics, rectors and UBC managers (TTO/innovation office/ incubators directors) of registered Higher Education Institutions (HEIs) in 33 countries in Europe and the European Economic Area.

Until now, Study 1 and 2 have focused on *"what"* and *"to what extent"* factors at the environmental and individual level affect the entrepreneurial behaviour of academics within a context of interaction, such as the context of UBC-based education. They mainly approach to the research question, from a quantitative perspective. However, complementary qualitative data is needed in order to enhance the understanding of quantitative findings.

In Study 3, the aim is to build a deeper understanding of *"how"* academics pursue opportunities within and through relationships with stakeholders in the social and institutional contexts, in other words *"how do they do it?"* Whereas the data for Study 1 and 2 is of quantitative nature, Study 3 employs a qualitative approach. The qualitative approach, more specifically a case study approach (Eisenhardt, 1989; Yin, 2003) was chosen for study 3 to better understand the networking behaviour of academic entrepreneurs in their unique context. This choice was made to be able to best portray current situations and activities. Following the recommendations from Zeller (1991) and Miles, Huberman, and Saldaña, (2014, p.324), qualitative research accounts for the researchers' engagements over time with the participants in their surroundings, therefore field observations supported our understanding of the behaviour of academic entrepreneurs in their surroundings.

Study 3 addresses the third research sub-question (RSQ3) of *"how does the networking behaviour of the academics affect their entrepreneurial engagements with external actors within the context of education?"* In order to address this question, Study 3 investigates the networking behaviour of academics within the context of their novel teaching practices executed in cooperation with external actors of the university. Following Forret and Dougherty (2004, p.420), the networking behaviour of academics represents *"the individuals' attempts to develop and maintain relationships with others who have the potential to assist them in their work or career"*. The above definition of networking behaviour also describes building relationships with others who have the "potential" to assist individuals in their work or career, whether or not assistance is ever provided (Forret & Dougherty, 2004).

To this end, study 3 uses a social networking perspective as a logical extension to the study of the generation of entrepreneurial social capital (Stam, 2015; Vissa, 2012). This study focuses on how academic entrepreneurs network, construct and leverage social contacts to create and execute teaching practices in cooperation with external actors. Following Hasanefendic et al. (2016), as well as Hasanefendic et al. (2017), these teaching approaches have been documented in the literature as novelties in teaching.

Finally, in study 4 an integrating view on both education and UBC in the light of the entrepreneurial behaviour of academics is taken. The last study of this dissertation (Study 4) addresses the fourth research sub-question (RSQ4) of *what are the effects on teaching of academics' entrepreneurial engagements with external actors?"* It explicitly addresses the role played by academic entrepreneurship in the learning experience of the students and focuses on the development of transversal skills through active, student-centred PBL executed in cooperation with business.

The majority of the studies have explored the effects of academic entrepreneurship through the study of spin-offs, licences, patents and economic growth (e.g. Grimaldi, Kenney, Siegel, & Wright, 2011; Shane, 2004; Vohora, et al., 2004). However, the impacts of entrepreneurial behaviour of academics on teaching, is an under-researched area (Davey, 2015, p.209). Hence, the last study of this dissertation takes into account the perspective of the students as being the main stakeholder of novel teaching practices and explores the effects of academic entrepreneurship on education. Their perspective is sought to confirm or refute the perspective of academics in regards to the benefits derived of UBC-based teaching practices.

The data used for the final study is based on a survey addressing current and former students who participated in teaching practices conducted in cooperation with business between 2004 and 2012. This quantitative data is complemented with qualitative responses from participants of the projects giving their testimonies on their learning experience when participating in teaching practices conducted with business.

Figure 2 presents the conceptual research model of this dissertation displaying the aforementioned relationships between the research sub-questions and their accompanying studies. The research sub-questions are outlined at the environmental and individual level, as the case may be in relation to the entrepreneurial behaviour of academics. *Table 3* presents the thesis overview on a research design matrix based on *Choguill (2005)*.

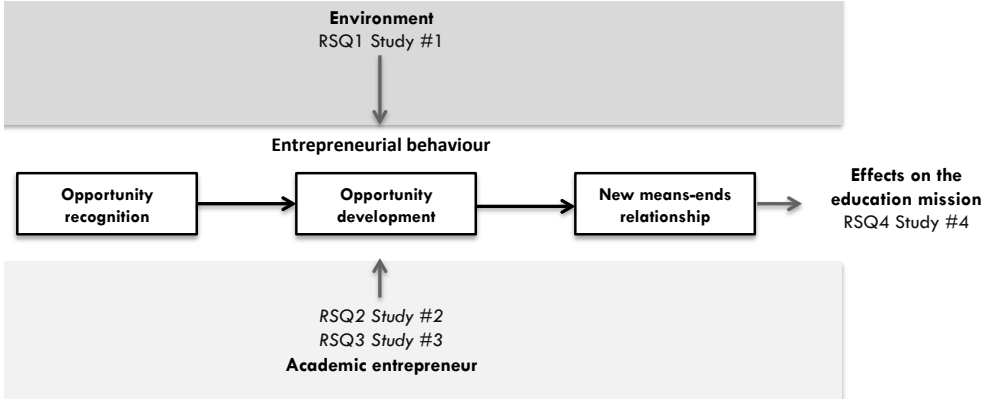


Figure 2. Conceptual research model

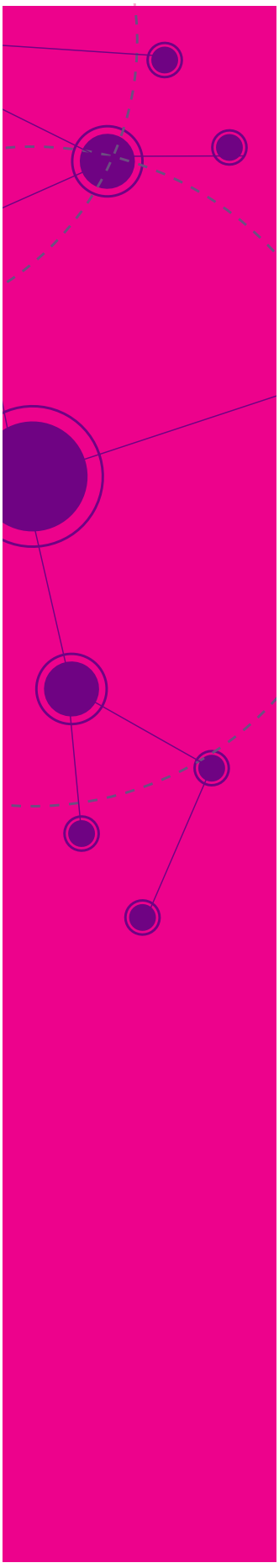
Table 3: Thesis overview in a research design matrix (Choguill, 2005)

Study	Research question	Data Source	Techniques of Analysis
Study #1, Chapter 3	What roles do barriers and drivers for university-business cooperation have in academic entrepreneurship?	**Primary research / Quantitative Data** **Research study** "Study on the cooperation between Higher Education Institutions and Public and Private Organisations in Europe" **Sample:** Academics from four countries in Europe: UK: 364 Germany: 880 Spain: 385 Poland: 225	Multiple linear regression analysis
Study #2, Chapter 4	To what extent does the networking competency of academics affect their entrepreneurial engagements with external actors within the context of education?	**Primary research / Quantitative Data** **Research study** "University-business cooperation in Europe: drivers, challenges, and opportunities" **Sample:** 312 academics from Germany	Multiple linear regression analysis and Mediation analysis

Study #3, Chapter 5	How does the networking behaviour of the academics affect their entrepreneurial engagements with external actors within the context of education?	**Primary research / Qualitative Data** **Data sources incorporated in the study:** - *Site visits / Observation* - *Semi-structured interviews with the main entrepreneurial educators* - *Discussions with academic peers of the entrepreneurial educators* - *Analysis of documents related to the teaching practice* - *Analysis of public documents and websites* **Sample:** Academics conducting teaching practices in cooperation with external actors of the university **Western Europe**: 3 academic educators **México:** 5 academic educators	A case-study approach (Eisenhardt, 1989; Yin, 2003) Analysis of documents and interviews performing a circular qualitative data analysis process (Miles et al., 2014)
Study #4, Chapter 6	What are the effects on teaching of academics' entrepreneurial engagements with external actors?	**Primary research / Quantitative Data** Survey of students participating in teaching practices conducted in cooperation with business and qualitative responses included in the survey. **Sample:** 150 Current and former students from one of the largest University of Applied Sciences in Germany participating in teaching practices conducted with business	Analysis of motivations and perceived benefits performing descriptive analysis and correlation analysis

Part B.

Presentation of the empirical papers



Chapter 3 Does context matter in academic entrepreneurship? The role of barriers and drivers in the regional and national context[1]

Abstract

With pressure on universities to better contribute to society, academic entrepreneurship is an increasingly recognised source of new knowledge and technologies as well as being a driver of the movement to a knowledge society. However, whilst growing, the level of academic entrepreneurship in Europe is still relatively low.

Two factors influencing this are inhibitors (barriers) and facilitators (drivers), however the understanding of how their interplay influences academic entrepreneurship, particularly across different contexts, is lacking.

For this reason, this study focussed on two environmental settings, European regions and countries, seeking to understand if it is the hurdle (barrier) or (and/or) tail-wind (drivers) that most impacts academic entrepreneurship and how the regional or national context influences this.

An online survey was translated into 22 languages and undertaken in 33 countries in Europe and the European Economic Area. From the original data set, 12 countries in four European regions provided a sample of 2925 responses, with a second step to focus on four "lead" countries within those regions.

The results show that there is a significant difference in the university-business cooperation barriers and drivers that affect academic entrepreneurship in the European regions. Furthermore, different barriers and drivers were found to significantly affect the four lead countries with barriers and drivers being able to provide a good explanation of the extent of academic entrepreneurship in the UK and Germany, and a more limited explanation of entrepreneurial activity by Spanish and Polish academics. Overall the article contributes to the literature of contextual entrepreneurship and also the understanding of factors influencing academic entrepreneurship.

[1] This chapter is a revised version of *Davey, T., Rossano, S., & van der Sijde, P. (2016). Does context matter in academic entrepreneurship? The role of barriers and drivers in the regional and national context. The Journal of Technology Transfer, 41(6), 1457-1482.*

3.1 **Introduction**

The university as a source of entrepreneurial activity, be it through leadership, education, the commercialisation of research into spin-outs or student start-ups (Klofsten & Jones-evans, 2000), has been increasingly acknowledged (Etzkowitz, Asplund, & Nordman, 2001). Academics in particular have been seen to have a more prominent role in the development of the knowledge society and economic growth (Etzkowitz & Leydesdorff, 2000; Klofsten & Jones-evans, 2000) through engaging in university-business cooperation (UBC) with a more narrow focus in literature on academic spin-outs and start-ups (Shane & Stuart, 2002).

Within the university, a number of factors have been found to influence the level of academic entrepreneurship, with the individual being the focus in a number of studies (Brandstetter, 1997; D'Este & Perkmann, 2011; Gaglio & Katz, 2001; Wright, Lockett, Clarysse, & Binks, 2006). More recently a number of studies have focused on the environment in which academic entrepreneurship takes place. Studies into the organisational context (Fini et al., 2011; Santoro & Gopalakrishnan, 2000; Tornatzky, Waugaman, & O'Gray, 2002) including culture (Kenney & Goe, 2004), top-level commitment (Anderson, Daim, & Lavoie, 2007) and peer interest (Tartari & Breschi, 2012) have all been found to influence entrepreneurial behaviour of academics. More generally, both on a national and regional basis, studies have also focussed on the mechanisms that can be instituted to support academic entrepreneurship (Klofsten & Jones-evans, 2000) whether they are policy mechanisms, regional strategies, structures approaches or activities. These studies have coincided with an undoubted increase in "entrepreneurial" behaviour of academics (D'Este & Perkmann, 2011), although the level of cooperation remains low as well as the engagement of academics in these activities (Davey et al., 2011b). Despite this, few studies have considered both the barriers and drivers for academic entrepreneurship, and even fewer have done so considering different national or regional contexts.

A more complete understanding is needed of what role is played by regional and national contexts as well as the way in which perceived barriers and drivers combine to create (or not) academic entrepreneurship.

The aim of the paper is to investigate the role the (institutional and regional) environment has on academic entrepreneurship across different European contexts. University academics' perception of their environment (internal and external) will be investigated in this study with specific focus given to the inhibitors (barriers) and facilitators (drivers) influencing their entrepreneurial endeavours. In achieving these aims, an empirical analysis will be undertaken using a data set of 2925 responses from European academics with the results analysed through the environmental or contextual lens of (i) European regions and (ii) selected European countries within these regions.

With this, the primary aim of the paper will be to determine: Is it the hurdle (barrier) and/or the tail-wind (drivers) that impacts academic entrepreneurship and how does the regional or national context influence this?

This study will contribute to literature in a number of ways: by building on factors affecting entrepreneurial behaviour by academics as well as highlighting the role of environment or context in academic entrepreneurship. Furthermore, the article seeks to provide greater understanding about the degree to which barriers and drivers interplay to affect the extent of entrepreneurial activity by academics and does so by providing a much-needed cross-national, as well as supranational analysis of this growing topic.

The paper will be structured as follows: a theoretical background for the paper will be provided in the second section which will explain the relevance of the influencing factors working towards a set of hypotheses. This section will also present a background on the countries being examined. The study methodology will be outlined in the third section providing details about the data collection and analysis. The paper will then conclude by presenting the results, discussion and conclusion.

3.2 **Environmental factors effecting the academic entrepreneur**

3.2.1 Background to academic entrepreneurship

Expectations regarding the engagement of academics in entrepreneurial endeavour in addition to their primary role in teaching and research have increased in recent years (Laukkanen, 2003). At a government policy level, the production and utilization of knowledge is increasingly becoming a crucial determinant of the economic growth and competitiveness of nations and their constituent private sector business (Jacob, Hellström, Adler, & Norrgren, 2000; Jones-Evans, 1998; Lundvall, 1999; Macpherson, 2002). Therefore, university business linkages are encouraged through a wide array of funding options available to such collaboration (Phan & Siegel, 2006; Wright et al., 2006). This has created additional pressure on universities to realize these opportunities in their environment through bridging the gap between industry and the universities (Mowery & Shane, 2002) and to generate additional economic returns (Shane & Stuart, 2002).

With the increased significance of the knowledge transfer activities performed by academics, a large body of research has begun to use entrepreneurship frameworks to study the engagement of academics in entrepreneurial endeavour (Mars & Rios-Aguilar, 2010), which has been conceptualized as "academic entrepreneurship". Notwithstanding the growing engagement of universities in academic entrepreneurial activities and the popularity of the term, (Rothaermel et al., 2007), "entrepreneurialism" in the academy has been ill defined causing controversy on the acceptance among the academic community and defying what actually constitutes an entrepreneurial activity (Audretsch, 2002).

Academic entrepreneurship has been narrow and broadly defined. In its narrow interpretation, it is synonymous of commercialisation of intellectual property originated from university resources (Etzkowitz et al., 2001) through university spin-off creation (Dickson, Coles, & Smith, 1998; Meyer, 2003) and academic start-ups. Under this definition, the commercialisation of university-generated knowledge through new ventures is often considered a way of achieving national competitiveness (McMullan & Vesper, 1987; Mowery & Ziedonis, 2002) and innovation (Lam, 2005).

In its broad definition, other authors have used the term to represent a wider array of knowledge transfer activities (Klofsten & Jones-evans, 2000). These authors defined academic entrepreneurship as the academic's engagement in entrepreneurial activities in addition to their normal academic duties and as the introduction of novelties to teaching (Etzkowitz & Leydesdorff, 2000; Laredo, 2007) and research (Louis et al., 1989). Such a broader definition acknowledges the dynamism and heterogeneity of academics and their motivations for carrying out different entrepreneurial activities.

This paper takes the narrow perspective of academic entrepreneurship, understood as university spin-off creation and academic start-ups, in the analysis of how barriers and drivers affect academic entrepreneurship.

3.2.2 The context of the academic entrepreneur

In their definition of entrepreneurship Ireland et al. (2003) acknowledged the importance of the context by stating that entrepreneurship is a context-dependent social process through which individuals and teams create wealth by bringing together unique packages of resources to exploit marketplace opportunities. The previous authors emphasised the organisational context, this definition acknowledges the role of the environment in shaping entrepreneurial actions and opportunities. In the same way, Casson (1982) and Shane and Venkataraman (2000) recognised that entrepreneurial opportunities are external environmental conditions.

An academic's immediate environment consists of the university, however as universities are closely intertwined with their wider national and supranational (understood as European regions in this paper) environments, it is possible to argue that the national and regional environment also influences the entrepreneurial activities of the academics. This premise is supported by the concept of Regional or National Innovation System within a region or country (RIS/NIS) (Freeman, 1995; Nelson, 1993).

This argument is supported by Porter and Stern (2002) who, by measuring the quality of "common innovation infrastructure", "cluster specific environment" and "quality of linkages", constructed the National Innovative Capacity Index, (NICI). According to these authors, the NICI illustrates how a national environment influences innovation and entrepreneurship and also how countries differ across the globe. The "cluster specific environment" and "quality of linkages" sub-indexes refer to the concentration of companies and institutions that foster innovation, whilst the latter could refer to the nation's university system and the quality of linkages with other formal and informal institutions and networks within a "common innovation infrastructure" (De Silva, 2012).

In the same vein, the Global Competitiveness Index (GCI), acknowledges the importance of these linkages by stating that an environment conducive to innovating activity is supported by extensive collaboration in research and technological developments between universities and industry by public and private institutions, in particular, by the extensive collaboration in research and technological developments between universities and industry (Schwab, 2014).

The former theoretical concepts suggest that as entrepreneurship is regarded a context-dependent social process, the perception of drivers and barriers for academic entrepreneurship will be affected by the national environments and the specific institutional conditions fostering that type of activity. At the national level, countries vary in the availability of resources and quality of institutions to foster entrepreneurial and innovation activities.

3.2.3 The factors influencing academic entrepreneurship

The allocation of individual resources to the exploitation of new opportunities cannot be considered in isolation from the broader institutional context in which such opportunity exploitation takes place, whether it is in their immediate, or wider national/supranational, environment. The general literature on entrepreneurship has argued that the ability of entrepreneurs to identify, and capitalise on, opportunities is highly influenced by the environment in which they operate (Scott, Fadahunsi, & Kodithuwakku, 2000; Ucbasaran, Westhead, & Wright, 2008). An academic's closer environment consists of the university, at the same time universities are embedded in an environment which comprises other actors especially government and industry (Etzkowitz & Leydesdorff, 2000; Eun, Lee, & Wu, 2006; O'Shea, Allen, O'Gorman, & Roche, 2004; Siegel, Waldman, Atwater, & Link, 2004). The characteristics of each actor, as well as the nature of interactions between them, have been

identified as determinants for the success or failure of academic engagement in entrepreneurial endeavours (O'Shea, Allen, Morse, O'Gorman, & Roche, 2007).

Within the university environment, top-down approaches can promote better linkages between universities and business (Tornatzky et al., 2002). Such approaches include organisational frameworks and conditions designed to promote linkages between universities and business, the provision of a suitable incentives structure for universities and the institutionalisation of such cooperation through the mission of the university. At the same time, universities can strive to remove barriers to university and business cooperation to promote the engagement of academics in entrepreneurial activities (Tornatzky et al., 2002).

From a bottom-up, perspective Laukkanen (2003, p.380) recognised that *"academic faculty do not necessarily categorically oppose academic entrepreneurship per se as it is sometimes assumed"* and *"academics should never be under-estimated"* (Birley, 2002, p.152), therefore universities should enable drivers to academic entrepreneurship and provide fitting incentives to individual academics by considering the different motives that drive them to collaborate with industry.

Motivation can be defined as the cognitive decision-making process through which goal-directed decision-making behaviour is initiated, energised, directed, and maintained (Huczynski & Buchanan, 2001). The motivations of the academic/scientist-entrepreneur are different from non-academic entrepreneurs. The traditional reasons that drive an individual to become an entrepreneur, such as the need for achievement and self-confidence (Locke & Baum, 2007), are not always the same as for academics. When a technological opportunity arises, the academic can decide to continue his/her research and teaching activities, or she can follow new goals like wealth and economic development. Academics, however, are often driven by diverse motives.

Based on this, D'Este and Patel (2007) argue that the combination of academic entrepreneurial activities provide entrepreneurs with the possibility to satisfy other motives, such as the need to access industrial resources, to learn from industrial problems, and to earn additional income. Specifically, Jones-Evans (1997) stated that when academics are motivated by a need to earn additional income, they tend to engage in consultancy rather than in start-ups.

Academics identify opportunities within an institutional environment filled with various clusters and networks. Entrepreneurial universities are involved in partnerships and networks with public and private organizations that are an umbrella for interaction, collaboration and co-operation (Inzelt, 2004). Shane and Venkataraman (2000) define entrepreneurship as a process where actors interact in such a way that opportunities are recognised and preparatory steps are taken in order to exploit the recognised opportunity.

A number of authors have recognised entrepreneurship as a form of UBC (Davey et al., 2011b), a method of academic external interaction (Abreu, Grinevich, Hughes, & Kitson, 2009) and a type of research valorisation (Wakkee, van der Sijde, & Nuijens, 2013).

Entrepreneurship, commercialisation of research and development (R&D) and cooperation in R&D have been embraced as actions in a broader activity, including three of the eight types of UBC (Davey et al., 2011b) and a range of academic external interaction activities (Abreu et al., 2009). For this reason, this paper too considers entrepreneurial behaviour by academics as part of a broader activity, in this case cooperation between university and business. As such, this paper's position is that an academic's entrepreneurial activity is subject to the broader conditions affecting UBC.

As firms and universities contribute different aspects to the collaboration, it is extremely difficult to combine these aspects without facing obstacles. Universities supply the cooperation with researchers and professors who are trained, therefore well qualified to conduct research or to teach potential or current workers (Göktepe, 2004). On the other hand, a lack of knowledge and skills on business management and entrepreneurship, as well as the application of theory, have been recognised as barriers to achieving success during academic entrepreneurial engagement (Dickson et al., 1998; Franklin, Wright, & Lockett, 2001).

A holistic view of the motives, activities, drivers and barriers provides a broader picture on the role of such elements in stimulating or hindering academic entrepreneurial activity. For instance, Aldridge and Audretsch (2011), who tested five factors (personal characteristics, human capital, social capital, financial resources, and TTO characteristics) that shape the individual scientist and their decision to act entrepreneurially, found that social capital had the largest impact on their propensity to be entrepreneurial. It can be argued that this collaboration can address the barrier of lack of knowledge and entrepreneurial skills. Therefore, linking barriers to drivers that academics perceive has been found to help academics overcome perceived barriers to academic entrepreneurship (Bruneel, Ratinho, Clarysse, & Groen, 2012).

Academics perceive a wide variety of benefits (status, contacts, financial revenues or academic acknowledgement) of engaging in entrepreneurial activities (van der Sijde et al., 2014), nonetheless engagement in academic entrepreneurial activities is not achieved without friction. Maintaining a balance between traditional academic duties and entrepreneurial activities imposes a challenge for academics working at the borders of two institutions (Wright et al., 2004; Jones-Evans, 1997).

This challenging task requires academics to see beyond their traditional remits of teaching and research. Academics need to manage cultural differences between business and academia (Plewa & Quester, 2008). Further, they not always have the skills required to act as a liaison between university and business. Therefore, a lack of entrepreneurial skills among academics (Laukkanen, 2003), and a reward system that does not intend to promote academic entrepreneurship (Jones-Evans, 1997), have been viewed as hindering the potential benefits of academic entrepreneurship.

On the other side, research into the reasons facilitating academic entrepreneurial behaviour has identified a variety of drivers of academic entrepreneurship. Comparing the different types of academic entrepreneurship, efforts to commercialise research through patenting and spin-off activity have been found to be generally motivated by funding, whereas cooperative research, including joint and contract research as well as consulting, have been found to be driven more by research-related motives (D'Este & Perkmann, 2011).

Acknowledging the different activities that academics undertake is relevant for deriving better government and university policies in promoting entrepreneurial activities among academics (D'Este & Patel, 2007). In this same line, recognising the nature of their motives in relation to these activities and their context seems to be a promising path to understand the drivers and barriers that both stimulate and hinder academics in their pursuit of opportunities.

With this background, the paper will now examine literature regarding firstly the barriers and drivers of the academic's immediate environment, and following that, the wider national/supranational environment factors affecting academic entrepreneurship.

3.2.4 Immediate environment inhibitors (barriers)

A number of obstacles or inhibitors hinder the process of academic entrepreneurship, which will be explained in the following section.

3.2.4.1 Awareness barriers

Awareness barriers are related to the structural barrier companies and universities face when having difficulties finding an appropriate cooperation partner (Barnes et al., 2002; Mitton et al., 2007; Plewa et al., 2013) . Depending on the size and industry sector, companies find it difficult to find appropriate contact persons for initial consulting (Stifterverband für die Deutsche Wissenschaft, 2007). This lack of knowledge hinders UBC and does not seem to be solved by being present in the mass media (Schartinger, Rammer, Fischer, & Fröhlich, 2002).

3.2.4.2 Funding barriers

A substantial barrier to UBC is the lack of funding (Yencken & Ralston, 2005), regardless of who is perceived to be the "funder", the business, the higher education institution (HEI) or an external government funding (Davey et al., 2011b). Maintaining a balance between normal academic duties and entrepreneurial activities is a challenging task for academics acting at the borders of two organisations. Funding often provides the ability and focus for the academic to devote valuable time to the project, when the competing priorities of teaching and research also demand their attention. Funding most commonly applies to cooperation in R&D, commercialisation of licenses or patents, or in entrepreneurship, through the creation of a start-up.

Funding has been documented as an incentive or driver to encourage academic entrepreneurial activities (D'Este & Patel, 2007; Wilson, 2012). The lack of funding can constitute a formal institutional barrier that may deter the intention of the academic to pursue the opportunity if the institution does not provide the appropriate institutional structure to encourage entrepreneurial activity.

3.2.4.3 Cultural barriers

Whether in respect to UBC or to an academic developing a new business, the most cited barriers to UBC generally are the distinct individual cultures and the social and economic roles of each institution, which may lead to an incompatibility between the university and business cultures (Bruneel, D'Este, & Salter, 2010; Rosenberg & Nelson, 1994). Their priorities concerning time- and market orientation differ to the extent that while scientific institutions seek to advance in their own interests, at their own pace and using their own methods of validation and reward, business focuses more on practicality, profits and commercial results (Bruneel et al., 2010; López-Martínez, Medellin, Scanlon, & Solleiro, 1994), leading to substantially differing expectations.

Additionally, bureaucracy on the side of the universities is often recognised as a major barrier. New business and Small and Medium Enterprises (SMEs) in particular can have problems in dealing with the labyrinthine of procedures of the academic institution (Plewa & Quester, 2006). In this line, the university environment can hinder entrepreneurial activities, especially those in collaboration with industry (Jones-Evans, 1998) as their structure may lack the ability to support and manage movement of research into a business setting.

3.2.4.4 Barriers relating to the usability of results

Barriers concerning the usability of results have been named as barriers to UBC and entrepreneurial activity from the perspective of HEIs and academics. As the name suggests, these barriers generally relate to the differences in what will be done with UBC results and how they will (or won't) be used. Universities are interested in disseminating knowledge - they have a desire for publication. On the contrary, industry seeks to acquire ownership, and sometimes to keep certain findings secret as a strategy of achieving competitive advantage (Barnes et al., 2002). From the university perspective there is a fear by academics that company confidentiality interests would prevent scientists from publishing (Perkmann & Walsh, 2007; Stifterverband für die Deutsche Wissenschaft, 2007; Hall et al., 2001).

This issue on intellectual property (IP) presents a great discussion point between the two parts involved into such cooperation (Hall, Link, & Scott, 2001). Unlike companies, universities perceive the value of IP as far more than only a revenue-producing resource, rather as a progression in knowledge. Moreover, universities are eager to publish the results before the IP has been protected or are not willing to guarantee the exclusivity of results (Hall et al., 2001). An additional barrier has been found on the firm-side in respect to their absorptive capacity (Bekkers & Freitas, 2010; Hu, 2012) and the knowledge breadth of firms (Caloghirou, Hondroyiannis, & Vonortas, 2003; Zhang, Baden-Fuller, & Mangematin, 2007). SMEs especially do not possess the necessary financial resources and are faced with high transaction costs (Reinhard & Schmalholz, 1996).

Thus, the hypothesis relating to "barriers" is:

> *Hypothesis 1:* That the perception of UBC barriers (awareness, funding, cultural and usability of results) have a significant effect on the extent of academic entrepreneurship in Europe.

3.2.5 Immediate environment facilitators (drivers)

Research into the reasons facilitating academic entrepreneurial behaviour has identified a variety of drivers for academic entrepreneurship (Aldridge & Audretsch, 2011; D'Este & Perkmann, 2011; Plewa & Quester, 2006), which will now be more deeply explored.

3.2.5.1 Relationship drivers

Relationship drivers stress the importance of the network for the academics. The importance of social capital for academics relies on the possibility to enhance existing resources, such as human capital, through social ties and networks. For example, the lack of knowledge and entrepreneurial skills has been perceived as a barrier to academic entrepreneurship (Laukkanen, 2003), the social network of academics with industry members can help to overcome the lack of human resources needed to act upon opportunities for the academic (Aldridge & Audretsch, 2011; Birley, 1985).

In research carried out in Columbia University and Stanford University, Colyvas et al. (2002) examined 11 case studies and found that in all but one case, researchers involved in spin-off creation were members of a network of scientists that included industry professionals. From the business side, according to (Etzkowitz, 2001), companies were increasingly interested in collaborative relationships with the academic scientists who prefer to have the professor involved in setting the strategic direction of the company and not only delivering the technology.

3.2.5.2 Access drivers

Academics have different motives for cooperating with industry (D'Este & Perkmann, 2011). Based on this, D'Este and Patel (2007) argue that it is a combination of factors – such as the need to access industrial resources, learn from industrial problems and earn an additional income – that motivate academic entrepreneurial activity.

Access drivers are related to both traditional missions of the university. On the research mission, academics are motivated by accessing real world relevant problems (Strunz, Yokoyama, & Palma Behnke, 2003) as well as resources for nurturing research projects (Jones-Evans, 1998). This practice of accessing the industry for sponsored R&D projects, is considered one of the starting points of the entrepreneurial tradition of the university (Etzkowitz, 1998).

From the economic perspective, cooperation with industry enables universities and academics in particular to diversify their funding resources (López-Martínez et al., 1994) and provide a strategy to respond to the pressure of governmental cuts in public funding and governmental rethinking on the allocation of public support of research in general (Morris, 2000).

3.2.5.3 Research drivers

From the industry perspective, the capitalisation on knowledge and skills from academics by involving them in the R&D of new products and services are among the main perceived benefits (Meyer-Krahmer & Schmoch, 1998). From the university perspective, Meyer-Krahmer and Schmoch (1998), in their study performed in Germany, stated that, in recent years, the allocation of industrial funds to university research has significantly increased and that, in time, universities use these funds to improve the quality of their research infrastructure (Siegel et al., 2004).

In relation to the former-mentioned driver, such as access to resources from the industry, other authors have explored the motivations from scientists in regards to their willingness to participate in commercial-related activities (Baldini, Grimaldi, & Sobrero, 2007; Fini, Grimaldi, & Sobrero, 2009; Göktepe-Hulten & Mahagaonkar, 2010). These authors have found, as cited in Lam (2011, p.5), that *"academics' involvement in commercial activities was not driven by the money incentive so much as the desire to generate research resources and gain reputation"*.

3.2.5.4 University mission drivers

The emergence of the entrepreneurial university proposes the encouragement of an entrepreneurial culture within academia, where business activities become part of the mission of the university and not an activity reserved for a special class of applied sciences universities (Etzkowitz & Leydesdorff, 2000). The entrepreneurial university is focused on fulfilling its missions of teaching, research and entrepreneurial activities simultaneously (Etzkowitz, 2004). This new university mission of entrepreneurialism is focused on its contribution to social development and economic growth (Schulte, 2004).

Laukkanen (2003) recognised that faculty do not necessarily oppose academic entrepreneurship per se. Academics do not need to be underestimated, as they are more similar to entrepreneurs than might initially be expected (Hay, Butt, & Kirby, 2002). Birley (2002) further proposes the formulation of a high-level strategy that demonstrates the university's intent, makes it clear that the university encourages this form of behaviour and provides the university's staff with the knowledge and support to conduct entrepreneurial activities.

Howells et al. (1998) identified that when collaboration with industry is part of strategic organisational policy, this constitutes one of the major drivers for conducting collaborative research. A further study found that the willingness of an academic to accept entrepreneurship as a part of the mission of the university increases the likelihood that academics will engage in academic entrepreneurship (Grimaldi et al., 2011).

Thus, the hypothesis relating to drivers is:

> *Hypothesis 2:* That the perception of UBC drivers (relationship access, research and university mission) have a significant effect on the extent of academic entrepreneurship in Europe.

3.2.6 Wider-environment context factors

3.2.6.1 Role of entrepreneurship-specific factors

The Global Entrepreneurship Monitor (GEM) also acknowledges that different entrepreneurial framework conditions along with special capacities and opportunities are needed for new business activity.

The conceptual framework from the GEM (GEM-Monitor, 2013) reflects the complexity of the bidirectional relationship of economic development in a country and the phenomenon of entrepreneurship. In spite of this complexity, the global study has contributed to our understanding of the heterogeneous entrepreneurial activities across the globe, as well as the high dependency of their causes and consequences on the local context.

The study highlights specific factors that have been found to influence entrepreneurial activity in a global sense, including the general perceived capabilities, attitudes to failure and perceptions of entrepreneurship within a country. Whilst motivations of academics do differ from the motivations of entrepreneurs generally, we believe that these general factors may also influence academics.

Highlighting the relevance of the context on entrepreneurial activity, the GEM also attempts to relate the motivations of individuals and the nature of their activity to the context where entrepreneurs operate. Based on this, entrepreneurs are classified under two main labels, namely, “opportunity entrepreneurs” and “necessity entrepreneurs”. The former are motivated by attractive reasons or “pull motives” (Gilad & Levine, 1986) and the majority are in high income economies. On the contrary, the latter are motivated by elements of necessity and these entrepreneurs act as a way to overcome external barriers (Bosma & Harding, 2006). In this case the significance of individual motive is higher when there is a lack of, or no, institutional support, particularly for academics to assist them in engaging in entrepreneurial endeavours (Erdős & Varga, 2009). Accordingly, necessity entrepreneurs have been found in lower level economies of less developed nations, which relates to Gross Domestic Product (GDP) per capita.

3.2.6.2 Role of the resource availability

Acknowledging the role of the environment in the entrepreneurship process, literature on academic entrepreneurship has also found that barriers and drivers to this type of activity are context specific (Shane, 2000; Van Dierdonck & Debackere, 1988) and therefore the activities of individuals cannot be considered in isolation from the broader environment where they operate.

The environmental context is involved in shaping the activities of entrepreneurs. The availability of data in the environment determines an entrepreneur's ability to perceive opportunities, while resources in the environment are required to capitalise on these opportunities (Scott et al., 2000). The previous argument is further supported by Powers and McDougall (2005) who utilised data from 120 universities in the US and found that financial, human and organisational capital from universities are strong predictors of academic entrepreneurship.

Further, Hitt et al. (2011) argued that entrepreneurial and strategic actions linked to wealth creation are products of the firm's resources. The resource-based view theory argues that firms decide to produce when they have sustainable competitive advantage, which is achieved by possessing rare, valuable, imperfectly imitable and non-substitutable resources (Barney, 1991). Based on this view, Eun et al. (2006) have further argued that, if the resource status of the university is weak, there is a lower tendency for academics to engage in entrepreneurial endeavour, and vice versa.

3.2.6.3 Role of Entrepreneurial Framework Conditions

In addition to the availability of resources, Baumol (1996) proposed that the form of entrepreneurship an entrepreneur chooses is governed by the prevailing "rules of the game", or the reward structure in the economy. Under this view, two conditions in particular were recognised as central to the process of allocation of effort into productive entrepreneurship: (1) the degree to which the rule of law is respected in the country, and (2) the degree to which laws support the appropriation of returns from entrepreneurial efforts. His contribution forms the basis for the incorporation of the Entrepreneurial Framework Conditions (EFC) from the GEM, which maps the specific conditions under which productive entrepreneurship can arise. Under this view, the EFCs are "defining the rules of the game" in a given context; change the EFCs, and the rate and nature of (productive) entrepreneurial activity will change (Levie & Autio, 2008).

3.2.7 Country and supranational comparisons

Both the national and supranational environments (for this paper: European regions of north, south, east and west) will be considered in this study.

3.2.7.1 Supranational comparisons (European regions)

Whilst there are many justifications for taking a national perspective, not least because this is the level of policy, there are fewer that point to the European supranational (European regions) context. The tendency to aggregate away important differences because national data is the most convenient to acquire, tends to ignore the influence of the regional or supranational level (Fagerberg & Verspagen, 1996). However, a key insight from a set of 30 good-practice UBC case studies highlighted that the concept of "good practice" is relative to the stage of development of UBC in the European region (Davey, Baaken, Deery, & Galán-Muros, 2011a, p. 11). For this reason, the influence of four European regions on the perception of barriers and drivers will be analysed.

> *Hypothesis 3:* That the perception of the UBC barriers and drivers facing academics in their entrepreneurial endeavours differs among regions

3.2.7.2 National comparisons (country)

With most policy decisions being made on a national rather than regional basis, in order to provide a more meaningful analysis of the role of "environment", a "lead" (largest economy) country was selected for the four European regions: United Kingdom (UK) (North), Spain (South), Poland (East), and Germany (West) to represent their region in the study. Whilst each of the countries were primary chosen because they were the largest country in each region, each had some defining characteristics which enriched the comparison. The UK was chosen for the entrepreneurial nature of its universities and its position as a leader in university education. Poland offers a fresh perspective because of the fact that it is a "new" European member state, whilst Spain presents a nation whose economy is suffering substantially due to the economic crises. Germany's selection is enhanced by its crucial role in adding the university's second mission of research through the "research university model" as well as the tenet of academic freedom which is a feature of German universities (Boulton & Lucas, 2011).

Table 4 illustrates the environment for selected countries in Europe in order to highlight the differences in (i) entrepreneurship-specific factors, (ii) availability of resources for innovations and entrepreneurship, as well as (iii) entrepreneurial framework conditions.

Table 4: Country comparisons

	Data area	Assessment criteria	UK	Spain	Poland	Germany
Entrepreneurship specific data[1]	*Entrepreneurship-specific factors*	Ranking from the GEM	9	35	43	5
		Perceived opportunities	35.5	16	26.1	31.3
		Perceived capabilities	43.8	48.4	51.8	37.7
		Fear of failure	36.4	36.3	46.7	38.6
		Entrepreneurial intentions	7.2	8.4	17.3	6.8
		Entrepreneurship as a good career choice	54.1	54.3	66.8	49.4
		High status to successful entrepreneurs	79.3	52.3	59.9	75.5
		Media attention for entrepreneurship	49.6	45.6	58.5	49.9
Resource-specific data[2]	*Financial Resources*	Global innovation index 2014	62.4	49.3	40.6	56
		GDP per capita 2014	36,208	31,942	23,273	43,475
		Government expenditure on R&D as a percentage of GDP	1.72	1.3	0.9	2.92
		% of government spending on total education	13.3	10.7	11.4	10.6
	Human resources	Number of researchers per 1 million people	4024	2719	1753	4139
	Technological resources	High-technology exports ($ million)	67,786.97	13,378.21	9,559.86	183,354.36
		Patent applications by residents	15370	3266	4410	46620
EFC[3]	*Institutional & policy frameworks*	Political stability	0.48	0.01	0.95	0.93
		Government effectiveness	1.47	1.15	0.71	1.52
	(Worldwide Governance Indicators 2014- Governance Scores - 2.5 to +2.5	Regulatory quality	1.77	0.93	1.05	1.55
		Rule of law	1.67	1.00	0.79	1.62
		Control of corruption	1.68	0.91	0.55	1.78

[1] (Singer, Amoros, & Moska, 2014); [2] (Cornell University, INSEAD, & WIPO, 2014); [3] (World Bank edstat, 2014)

Comparing *entrepreneurship-specific factors*, it can be seen that Germany and the UK are ranked as markedly superior environments for entrepreneurship as compared to Spain and Poland. Perceived opportunities and the high status awarded to successful entrepreneurs in particular, highlight the differences, despite the fact that higher perceived capabilities, entrepreneurial intentions and entrepreneurship being a good career choice are higher in the "lead" countries for Southern and Eastern Europe.

In respect to the *availability or presence of resources*, the UK and Germany once again come out ahead, with the global innovation index ranking both better environments for innovation. The link between GDP per capita and student entrepreneurial intentions has been recognised (Davey, Plewa, & Struwig, 2011), and again, the UK and Germany are superior. This is reinforced in their greater investment in both research per capita, particularly in Germany, as well as the availability of human and technical resources.

The pattern of superiority continues in assessments of *Entrepreneurial Framework Conditions* with the UK and Germany both rated more highly than their southern and eastern counterparts, with corruption an issue in both countries, especially in Poland.

Despite this simplified view, whereby east and south as well as north and west are largely agglomerated, differences between the Polish and Spanish as well as UK and German environments exist.

Additionally, these statistics suggest that academics in Poland and Spain face a lower level of available resources for innovation, and according to the general entrepreneurship literature, could also present a lower level of academic entrepreneurial activity. Furthermore, and based upon the general entrepreneurship literature, it is imagined that academics in countries with lower availability of resources, specifically funding, may have a higher perception of funding barriers and / or a higher perception of access drivers for academic entrepreneurship. This view could be supported by the general entrepreneurship literature that argues that the ownership of resources is not mandatory, and entrepreneurs creatively find alternative means of making use of resources when capitalising on opportunities (Kirzner, 1973; Shane & Venkataraman, 2000; Stevenson & Jarillo, 1990).

Owing to the substantial differences between the country conditions in respect to entrepreneurship, the following country-specific hypothesis can be formulated:

> *Hypothesis 4:* The effects of barriers and drivers for UBC on the extent of academic entrepreneurship vary across countries.

3.3 **Methodology**

3.3.1 Sample

The data used in this study was collected in the framework of a European project. For this study an online questionnaire was created, translated into 22 languages, sent via email to all rectors and UBC managers (Technology Transfer Office (TTO)/innovation office/ incubators directors) and academics of registered HEIs in 33 countries in Europe and the European Economic Area, and remained open to access during two months, resulting in 4,280 completely filled out.

From the original data set, the responses from academics and from 12 countries were selected deemed to have sufficient responses for original analysis. With the aim of establishing if there were differences in factors affecting academic entrepreneurship across European regions, the 12 countries were divided into four European regions as defined by the United

Nations, with three countries in each of the four regions. The response totals were as follows: north (Finland n=39, Sweden n=94, and United Kingdom n=364), south (Italy n=273, Portugal n=93, Spain n = 385), east (Hungary n=64, Poland n=255 and Romania n=80) and west (France n=289, Germany n=880 and Netherlands n=136) for a total of 2952 responses.

For a more insightful analysis, four "lead" European countries were selected, as all were the largest economy in their respective regions. The response sample in each of the countries was as follows: Germany n=880, UK n=364, Poland n=255, and Spain n=385.

3.3.2 Variables

The dependent variable for the study was the variable "extent of academic entrepreneurship", a self-assessed variable by the academic on a 10-point scale of 1= "not at all" to 10 = "high". The independent variables relate to the inhibiters (barriers) and facilitators (drivers) of the more general concept of UBC, of which academic entrepreneurship is described as one form of cooperation (Davey et al., 2011b). As such, the perception of the UBC barriers and drivers is said to have an influence on academic entrepreneurship activity. A process of variable reduction was undertaken in the form of a factor analysis to create the eight independent (factored) variables, as shown in Table 5.

Control variables: The independent (control) variables in this study are country, gender and age of the respondent, the type of university (university, university for applied sciences, technical university, other school), and area of knowledge (biomedical sciences, technology and engineering, social sciences and humanities).

Table 5: Independent variables

Construct	Factored variable	Variable
Drivers	1. Relationship drivers *(Cronbach's α = .943)*	▪ Existence of mutual trust ▪ Existence of mutual commitment ▪ Having a shared goal ▪ Understanding of common interest by different stakeholders ▪ Prior relation with the business partner ▪ Cooperation as effective means to address societal challenges and issues
	2. Access drivers *(Cronbach's α = .867)*	▪ Employment by business of university staff and students ▪ Interest of business in accessing scientific knowledge ▪ Access to business-sector research and development facilities ▪ Possibility to access funding / financial resources for working with business
	3. Research driver	▪ Successful UBC is vital to my research
	4. University mission driver	▪ Successful UBC is vital to achieving the mission of the university
Barriers	5. Awareness barriers *(Cronbach's α = .695)*	▪ Business lack awareness of university research activities / offerings ▪ Universities lack awareness of opportunities arising from University-Business cooperation ▪ Difficulty in finding the appropriate collaboration partner ▪ No appropriate initial contact person within either the university or business
	6. Funding barriers *(Cronbach's α = .786)*	▪ Lack of financial resources of the business ▪ The current financial crises ▪ Lack of university funding for University-Business cooperation ▪ Lack of external funding for University-Business cooperation
	7. Cultural barriers *(Cronbach's α = .733)*	▪ Differing motivation / values between university and business ▪ Differing mode of communication and language between university and business ▪ Differing time horizons between university and business ▪ Bureaucracy within or external to the university
	8. Usability of results barriers *(Cronbach's α = .820)*	▪ The focus on producing practical results by business ▪ Business fear that their knowledge will be disclosed ▪ The need for business to have confidentiality of research results ▪ Limited ability of business to absorb research findings ▪ The limited absorption capacity of SMEs to take on internships or projects ▪ A lack of contact people with scientific knowledge within business

3.4 **Results**

3.4.1 Regional differences in extent of entrepreneurship, perceived barriers and drivers

As is evident in *Table 6*, the primary barriers in *Northern Europe*, the region with the highest extent of academic entrepreneurship, are funding (6.60) and cultural barriers (6.40), which are partially balanced by a high recognition of relationship drivers (7.10), as well as the "university mission" driver (6.16), although the region's academics see research as the lowest recognised driver for entrepreneurship of the four regions. The *Southern European* region, however, experienced most of the highest recorded barriers for all four barrier types and some of the lowest drivers recorded, with the exception being the "university mission" driver (6.78), which is the highest of the four regions. Eastern Europe, the region with the lowest extent of academic entrepreneurship, is generally characterised by some of the highest UBC barriers and lowest UBC drivers. Finally and conversely, Western Europe is characterised by most of the lowest UBC barriers and highest UBC drivers, although this isn't converted into the highest extent of academic entrepreneurship.

Across Europe (all four regions), cultural-, followed by funding barriers, were the biggest inhibitors whilst relationship and university mission were the biggest drivers.

To assess the difference between the dependent and independent variables between the regions, a Kruskal-Wallis test was undertaken. The results in the table below show that for all variables, there is a significant difference in the dependent and independent variables in respect to the regions.

Table 6: Differences in perceived barriers and drivers between regions

Region	North *(UK)*	South *(Spain)*	East *(Poland)*	West *(Germany)*	**All**	**K-W Sig.**
n=	364	385	255	880	**1884**	0.000
Extent of academic entrepreneurship	3.81	3.01	2.73	3.22	**3.20**	0.000
Awareness barriers	6.00	6.93	6.59	5.80	**6.33**	0.000
Funding barriers	6.60	7.30	6.72	5.71	**6.58**	0.000
Cultural barriers	6.40	7.14	6.64	6.22	**6.60**	0.000
Usability of results barrier	5.86	6.45	6.47	5.72	**6.12**	0.000
Relationship drivers	7.10	6.64	6.03	7.22	**6.74**	0.000
Access drivers	5.95	5.96	5.07	6.23	**5.80**	0.000
Research driver	5.24	5.64	5.81	6.30	**5.74**	0.020
University mission driver	6.16	6.78	6.63	6.16	**6.43**	0.000

Means scale: Dependent variable means scale: 1= "not at all", 10 = "high"

3.4.2 Differences in extent of academic entrepreneurship, perceived barriers and drivers between lead countries

In order to determine the influence of UBC barriers and drivers on academic entrepreneurship in these countries, a linear regression analysis was made using the t-value and significance to determine effect at a 95% confidence ($p<0.05$), and the beta value to determine direction of the influence. Additionally, an R^2 was determined to test the ability of the control and independent variables to explain the extent of entrepreneurship undertaken by the academic. The table below shows the beta values for the regression analysis. A regression analysis will be utilised to determine the significance of the barriers and drivers model for each of the four countries in order to determine if they play a significant role in explaining academic entrepreneurship in each country.

Table 7: Regression on academic entrepreneurship

		ALL		UK (N)		Spain (S)		Poland (E)		Germany (W)	
	Extent of academic entrepreneurship[+] (mean)	**3.32**		**3.36**		**3.25**		**2.33**		**3.08**	
Control variables	Country										
	France	.061	.011								
	Germany										
	Hungary	.022	.013								
	Italy	-.009	-.063								
	Netherlands	.056	.029								
	Poland	-.015	.000								
	Portugal	.039	-.008								
	Romania	.047	-.011								
	Spain	.088*	.039								
	Sweden	.263**	.173**								
	UK	.172**	.156**								
	Finland	.045	.020								
	Gender	-.054	-.036	-.077	-.032	-.208*	-.120	-.041	-.017	-.017	.033
	Age	.076*	.087**	.221**	.135*	-.033	.013	.013	-.055	.020	.021
	Type of university										
	Traditional universities										
	Universities of applied sciences	-.037	-.064	-.097	-.054	-.042	-.047	-.262	-.288	-.076	-.115*
	Technical universities	-.013	.002	-.267**	.136	-.114	-.175	-.141	-.292	-.113	-.080
	Other universities	.005	.003	-.283**	-.207**	.107	.084	.003	-.052		
	Area of knowledge										
	Biomedical sciences	-.262**	-.213**	-.589**	-.509**	-.176	-.145	-.288	-.390	-.203**	-.093
	Technology & engineering	-.056	-.069*	.304**	.183*	-.020	.032	-.279	-.257	-.173*	-.128*
	Social sciences										
	Humanities	-.089*	-.020	-.354**	-.069	.022	.045	-.177	-.152	-.016	.085
Independent variables	Awareness barriers		-.014		-.054		-.128		-.119		-.035
	Funding barriers		-.070		.364**		-.083		.211		.100
	Cultural barriers		.105*		-.043		.216		.164		.120
	Usability of results barriers		.040		.003		-.097		-.323		-.023
	Relationship drivers		.007		-.113		.031		.042		-.016
	Access drivers		.133**		.475**		.219		-.243		.033
	Research driver		.228**		.252		.293**		.239		.221**
	University mission driver		.162**		-.189		.043		.039		.421**
	R^2	**0.133**	**0.308**	**0.473**	**0.723**	**0.092**	**0.320**	**0.212**	**0.341**	**0.039**	**0.385**
	Adj. R^2	**0.114**	**0.287**	**0.436**	**0.681**	**0.015**	**0.194**	**0.035**	**-0.039**	**0.014**	**0.350**

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed)

[+] Dependent variable means scale: 1= “not at all”, 10 = “high”

The results in *Table 7* highlight both the differences in the role played by UBC barriers and drivers in the respective countries as well as the differing ability of UBC barriers and drivers to explain the extent of academic entrepreneurship in those countries.

In the UK, "access drivers" and "funding barriers" have a significant effect on academic entrepreneurship. For Spain, only the "research driver" (belief that UBC is vital to their research) plays a significant role in levels of entrepreneurship for academics, with UBC barriers playing no significant role. For Polish academics, neither UBC barriers nor drivers play any significant role on their entrepreneurial behaviour.

Conversely, for German academics, whilst barriers play no significant role, the UBC drivers "research driver" and "university mission driver" significantly explain the entrepreneurial behaviour of academics.

A Kruskal-Wallis analysis revealed that, like the regional data, there is a significant difference between the four countries in respect to the perception of UBC barriers and drivers by academics.

The results of the regression analysis (column "ALL") involving all collected data show that the variables "age", "biomedical sciences" and "technology and engineering" are significant. Furthermore, it shows that the control variables "age" and "biomedical sciences" are significant in both tested models (without and with the experimental variables).

The four individual countries show completely different pictures. The models fit Germany and UK, and the experimental variables contribute significantly to the explained variance. Although the models also fit the other two countries, the experimental variables do not explain much variance (except research drivers in Spain).

3.4.3 Summary of hypotheses

The following table summarises the results on the paper's hypotheses and includes the hypothesis and the independent variable, which is being tested for its ability to explain the dependent variable(s).

Table 8: Summary of hypothesis results

Hypotheses	Indep. Variable	Dep. Variable	Result of hypothesis
H1: That the perception of UBC barriers have a significant effect on the extent of academic entrepreneurship in Europe.	Awareness, funding, cultural and usability of results barriers	Extent of academic entrepreneurship (ALL)	**Supported** for cultural barriers **Rejected** for barriers related to awareness, funding and usability of results
H2: That the perception of UBC drivers have a significant effect on the extent of academic entrepreneurship in Europe.	Relationship, access, research and university mission drivers	Extent of academic entrepreneurship (ALL)	**Supported** for access, research and university mission drivers **Rejected** for relationship drivers
H3: That the perception of UBC barriers and drivers facing academics in their entrepreneurial endeavours differs among regions.	NA	NA	**Supported** for all barriers and drivers (See *Table 6*)
H4: The effect of barriers and drivers for UBC on the extent of academic entrepreneurship varies across countries	Barriers and drivers for UBC on each of the selected regions	Extent of academic entrepreneurship	**Supported**

3.5 **Discussion and management implications**

The results presented in *Table 6* suggest that the regional context in Europe does play a role in the extent of academic entrepreneurship. With the European regions being subject to differing levels of economic development and having unique histories and cultures, a wider supranational context seems to be relevant in UBC and academic entrepreneurship. This result from *Table 6* provides strong support for *Hypothesis 3*. This implies that the supranational context has its own conditions and means that regional and national policy-makers and practitioners need to consider, in addition to a national framework, a supranational framework including culture and extent of entrepreneurial and economic development. For European policy makers, it would seem reasonable to target European regions with differing polices for developing UBC and academic entrepreneurship.

For UK academics, drivers play an obvious and logical role in influencing them to be entrepreneurial. Access to opportunities, including resources, funding, data and work, as well as interest in getting their research into use, are strong influencing factors for them to undertake entrepreneurial activity, as is the ability of the entrepreneurial activity to contribute to their research objectives. Whilst at first glance the positive relationship between the significant "funding" barriers and academic entrepreneurship seems curious, upon greater reflection a logical explanation is highly plausible. Having established that UK academics are driven by opportunity and that entrepreneurship is recognised as a means for capturing

opportunity (Ahmad & Seymour, 2008), it seems logical that the higher the perceived barriers for research results to be utilised by business and the higher the perceived inability for someone to fund their research, the more likely an academic would be to seek their own path to these opportunities.

The role of UBC drivers on *German academics* cannot be underestimated as they pursue entrepreneurial behaviour to benefit their research and align with their perceived role of the university's mission. With no significant barriers, to improve academic entrepreneurship in a German setting is a driver-driven process, achieved by promoting and improving the ability of entrepreneurial behaviour by academics.

For Spanish academics, whilst UBC barriers and drivers have a limited effect on their entrepreneurial behaviour, they are motivated by entrepreneurship when they perceive UBC (including entrepreneurship) as beneficial to their research. A study of UBC in Spain revealed a lack of strategies in place, especially those that supported the process of UBC including incentives and promotion (Galán-Muros, Davey, Testar-Ymbert, Meerman, & Sánchez-Contreras, 2013). Furthermore, the study found that "the practice of recruiting industry professionals into the knowledge transfer area" and "the presence of academics on company boards" were less developed than other mechanisms and provide insights for improvement..

Entrepreneurial activity by academics in Poland is influenced by factors other than the UBC barriers and drivers in this study, such as conditions in the national environment and institutional or individual motivational factors, which were not tested, especially those relevant for innovation and entrepreneurship. As an example, whilst UBC barriers and drivers did not significantly influence academic entrepreneurship, another study found that a lack of strategies and incentives potentially represents a significant lack of commitment and cultural orientation to UBC in Poland (Davey, Galán-Muros, Meerman, & Kusio, 2013).

It can be noted that in three of the four countries, none of the barrier variables play a significant role in academic entrepreneurship, and in three of the four countries, driver variables do play a significant role, particularly in Germany, where drivers are highly significant. This may suggest that UBC drivers play a larger role in an academic's entrepreneurial behaviour than barriers and should thus receive greater focus by policy makers.

In regards to the models (R^2) for the respective countries, it must firstly be stated that the control variables play only a limited role in explaining academic entrepreneurship. In reviewing the overall R^2 of the different country models, there are substantial differences in the influence of UBC barriers and drivers on academic entrepreneurship witnessed. For the UK, over 72% of the variance in academic entrepreneurship is explained by UBC barriers and drivers, whilst in Germany, over 38% is explained, representing a high and moderate degree of explanation in the two countries respectively. Whilst still notable, Spain recording 32% owes less of its entrepreneurship in academia to the independent variables, whilst in Poland the model does not explain the extent of academic entrepreneurship. This means that in Spain and Poland particularly, factors other than the UBC barriers and drivers tested affect the extent of academic entrepreneurship.

These results could support the general entrepreneurship literature, which has argued that acquisition of resources is important in being entrepreneurial (Etzkowitz & Leydesdorff, 2000; Siegel et al., 2004) and specifically in terms of academic entrepreneurship (Van Dierdonck & Debackere, 1988). The results from Poland reinforce the statement that "barriers are context specific" from a study performed in Belgian universities (Van Dierdonck & Debackere 1988). Poland, when compared with Germany and the UK, exhibits

a lack of resources that are significant for conducting academic entrepreneurial activity, such as the number of researchers per 1 million people (1753 in Poland vs 4139 in Germany and 4024 in UK), government spending in R&D as a % of GDP (0.9 in Poland vs 2.92 in Germany and 1.72 in the UK), high technology exports (9,559.86 in Poland vs 183,354.36 in Germany) and patent applications by residents (4410 in Poland vs 46620 in Germany and 15370 in the UK).

In terms of management implications, the study highlights that environment is an important consideration, with a link between development and academic entrepreneurship activity suggested. Whilst there is rightly focus on the barriers to academics being entrepreneurial, of which there are many, it is important to provide as much, if not more focus on drivers for two reasons. Firstly, there were significant drivers, for the UK and Germany in particular, and secondly, there has been found to be a relationship between drivers and barriers – indeed, academics who perceive drivers have been found to overcome barriers to academic entrepreneurship (Bruneel et al., 2012).

3.6 **Conclusion**

The allocation of individual resources to the exploitation of new opportunities cannot be considered in isolation from the broader institutional context, in which such opportunity exploitation takes place. This is true generally for entrepreneurs as well as academics. The study discussed that the entrepreneurship process occurs across multiple levels of society.

Moreover, a main contribution of the study has identified the importance that context plays in academic entrepreneurship and how supra-regional and national contexts play a role. This impacts not only on the extent of entrepreneurial activity, but also on the difference in the way barriers and drivers play a role in this.

A further major contribution has been to analyse how barriers and drivers influence the development of academic entrepreneurship across European regions and four national lead countries within those regions. The study highlighted the difference in the extent to which "barriers" and "drivers" explain academic entrepreneurship, with them being highly relevant in mature markets such as the UK and Germany and less relevant in Spain and Poland - countries with challenges relating to lower levels of development. This suggests that less developed countries have their own challenges, not yet captured in research on UBC barriers and drivers, and need to adapt context specific mechanisms rather than just imitating the strategies, mechanisms, structures and activities implemented in developed countries.

The multilevel nature of the process of entrepreneurship also suggests that a context specific understanding of academic entrepreneurship is needed in order to develop the required capacities that would develop effective social and economic benefits.

3.6.1 Limitations

Since the data used in this study was collected in the framework of a European project, there was no common measure to gauge the impacts of barriers and drivers on academic entrepreneurship. The dependent variable in this study, "extent of academic entrepreneurship", was self-reported; further research could concentrate on developing a more objective measure of academic entrepreneurship.

3.6.2 Further research

Whilst the literature used to construct the items for barriers and drivers has been performed in developed countries, there is a need to conduct more empirical research in contexts where academics face a lower level of national and institutional resources relevant to innovation and entrepreneurship. Furthermore, greater knowledge about the role of supranational, national and regional factors affecting academic entrepreneurship, along with the interplay of supporting mechanisms and factors inhibiting or facilitating UBC, including academic entrepreneurship, would provide greater insight into this area. One approach to providing greater insight into the role of context, could be a systemic approach, addressing the role of National Innovation Systems (NIS) and Regional Systems of Innovation (RSI) in an academic's perception of barriers and drivers for academic entrepreneurship by incorporating the perceptions of academics regarding the quality of their institutional environment; thus incorporating measures of the NIS and RSI into the study.

In the same line of a systemic view of academic entrepreneurship, a GEM-type study of academic motivations and intentions for entrepreneurship, incorporating the perceptions of experts with a qualitative approach to scanning the national environment, would also provide a more complete understanding of the topic.

Acknowledgements

Many thanks to Victoria Galan-Muros for her input into the paper and also to the DG Education & Culture from the European Commission for their funding of the study on the cooperation between HEIs and public and private organisations in Europe, which contributed to this work.

Chapter 4 The role of the networking competency of the academics in university-business cooperation within the context of education: An integration of social capital and social cognitive theories

Abstract

Perceptions of academics with respect to their networking competency to handle University-Business Cooperation (UBC) activities, has received limited attention in the context of their teaching practices executed with business. This paper addresses this research gap by examining the role of the networking competency of the academic entrepreneur in UBC-based education, from a sociological perspective. We contribute to existing research by combining literature streams from the fields of academic entrepreneurship, UBC, social capital and social cognitive theory, to understand how and to what extent the perceptions of academics about their social capital and their self-efficacy with respect to their networking behaviour, affect the extent of development of UBC-based teaching. To answer the research question, a conceptual model grounded in social capital and social cognitive theories was developed. The empirical research is based on a survey implemented to academics in Germany. The final data set used for this study includes a total of 312 responses valid for analysis. Through a series of regression analyses and mediation analyses the findings of this paper highlight the importance of relational capital for academics in their role of educators, as well as the importance of their self-efficacy in respect to their networking competency to handle UBC-based teaching practices. Implications of the findings for entrepreneurship educators and university management are ultimately discussed along with suggestions for further research.

4.1 **Introduction**

Given the growing external expectations on universities to improve their contribution to society, academics are considered to have a prominent role in shaping the knowledge society and promoting economic growth (D'Este et al., 2012). The extended role and societal relevance of academics is reflected by increased engagement in "productive interaction" with public organisations (Wakkee, van der Sijde, Mashuri, & Sharp, 2015) and in academic spin-offs and start-ups (Shane & Stuart, 2002). Hence, aspects such as individual, attitudinal and behavioural characteristics affecting the engagement of academics in entrepreneurial activities has gained increased attention (Azagra-Caro, 2007; Lam, 2011) (Wakkee et al., 2015).

Through the study of individual characteristics, the networks of academics and their social interactions have also proved to be important predictors of academic engagement in entrepreneurial activities (Audretsch, Aldridge, & Sanders, 2011). When it comes to scholars, academics and scientists, social capital gives them access to a wide array of relevant resources and knowledge, which has an impact on their propensity to be entrepreneurial. While literature sheds light on the benefits and consequences of networks for entrepreneurial endeavours within the context of the university, it treats the role of the individual as a "black box", implicitly assuming that entrepreneurial individuals are non-strategic actors that do not intentionally pursue valuable new connections (Stuart & Sorenson, 2007).

Considering this and the reflections of Perkmann et al. (2013) on the need to study how individuals within organisations initiate, build and maintain collaborations with other individuals (in organisations), as well as the outcomes of such engagements, this study aims to consider how academics' perceptions about their social capital and networking behaviour affect the extent of development of UBC-based teaching. Furthermore, this research aims at understanding the role of the academics' self-efficacy with respect to their networking competency in this relationship.

Perkmann et al. (2013) and Davey (2015) recently addressed the impact of UBC on higher education outputs as a core point on the future research agenda in the fields of academic engagement, UBC and academic entrepreneurship. Therefore, this research addresses the following question: How and to what extent do the perceptions of academics about their social capital and their self-efficacy with respect to their networking behaviour, affect the extent of development of UBC-based teaching?

To answer the research question, a conceptual model grounded in social capital and social cognitive theories is developed and tested, to understand how academics' perceptions about their immediate social environment influence them in engaging in UBC-based teaching, as well as the role of the self-efficacy of the academic with respect to his or her networking competency in this relationship. Social capital theory is used to supplement social cognitive theory in the sense that the contextual components of the immediate social environment of the academic are constructed along the three dimensions of the social capital, namely the structural, the cognitive and the relational dimensions.

The paper will be structured as follows: the paper's conceptual background, explaining the concepts of UBC-based teaching and academic entrepreneurship within the teaching context, is provided in the second section. The third section provides the theoretical background that has guided our research model. That section explains the relevance of the influencing factors on UBC-based teaching and works towards the development of a set of hypotheses. The study's methodology will be outlined in the fourth section, providing details about the data

collection and analysis. The paper will then conclude by presenting the results and discussion sections.

4.2 **Conceptual background**

4.2.1 University-business cooperation in teaching (UBC-based teaching)

Universities are to be regarded as the most relevant organisations in a knowledge-based society (Etzkowitz, 2008). Many concepts such as University-Business Cooperation (UBC) and the Entrepreneurial University build on the assumption that industry-university-Government all working in harmony have the potential to advance innovation, employment and ultimately the economic and social wellbeing of people (Etzkowitz, 2008). However, these cooperative activities might entail a new function for research and education. As such, UBC also has the potential to add value to the education mission of the university. One of the greatest benefits from these partnerships is the development of students' skills and competencies, and consequently enhancement of the students' employability and entrepreneurial skills (Baaken et al., 2015; Kiel, 2014) (Forsyth et al., 2009; Plewa et al., 2015). Acknowledging the potential benefits of UBC in education, this research focuses on UBC within the context of teaching, hereby conceptualised as UBC-based teaching. It is understood as the delivery of programmes, courses and content to students via a large range of mechanisms (e.g. guest lecturers from industry, UBC-based PBL) placements and other (Davey et al., 2011b; Plewa et al., 2015).

The study of academics' engagement in UBC-based teaching is relevant to the current debate on university engagement and higher education. On the one hand, "universities are making their teaching and research programme more responsive to regional knowledge needs" (Gunasekara, 2006, p. 144). The rationale behind this argument is that universities are centrally important in the development of regional human capital (Chatterton & Goddard, 2000; Plewa et al., 2015). In line with these arguments, research has demonstrated that programmes that are strongly anchored in the world of work are also highly effective in enhancing the level of discipline-specific knowledge and skills of graduates (Van der Velden & Allen, 2011, p.131), as well as in the production of graduates with the required knowledge and skills for the workforce (Ssebuwufu, Teralynn, & Margaux, 2012). On the other hand, it is now widely accepted that HEIs should go beyond preparing students to meet the demands of the labour market (Pavlin, 2016). According to Teichler (2013, p.422-423) *"…Higher education does not have to teach the rules and tools needed in a certain moment in time, but also prepare students to challenge constantly conventional wisdom. […] Graduates have to be sceptical and critical, able to cope with indeterminate work tasks and able to contribute to innovation"*.

In summary, this study recognizes the importance and potential synergies between UBC and teaching and it analyses factors affecting the development of UBC-based teaching from a social capital and social cognitive theory perspectives.

4.2.2 Academic entrepreneurship in the context of UBC-based teaching

Academic entrepreneurship has been narrow and broadly defined. In its narrow interpretation, it is synonymous of commercialisation of intellectual property originated from university resources (Etzkowitz et al., 2001) through university spin-off creation and academic start-ups (Meyer, 2003) . In its broad definition, other authors have used the term to represent a wider array of knowledge transfer activities (Klofsten & Jones-evans, 2000). These authors defined "academic entrepreneurship" as the academic's engagement in entrepreneurial activities in addition to their normal academic duties and as the introduction of novelties to teaching (Etzkowitz & Leydesdorff, 2000; Laredo, 2007).

A narrow definition of academic entrepreneurship is rooted in an economic perspective and has overemphasised the commercial orientation of the entrepreneurial behaviour of academics (Shane, 2004; Shane et al., 2015; Wright et al., 2007). Alternatively, a sociological perspective on academic entrepreneurship has at its core the creation of value from the activities of scholars in cooperation with non-academic organisations (Spaapen & Drooge, 2011; Van der Sijde, 2012). This approach recognises how universities and business can exchange knowledge in diverse forms (Lamichhane & Sharma, 2010; Teixeira & Mota, 2012), such as through education-based collaborations (e.g. Caniëls & Van den Bosch, 2011).

Through UBC-based teaching, universities and business, as well as other actors in the external environment, engage in a knowledge circulation process (Van der Sijde, 2012), where the university not only transfers knowledge to external organisations, but also receives knowledge from the industry in order to improve teaching practices (Baaken et al., 2015; Hasanefendic et al., 2016; Plewa et al., 2015). To this end, the cooperation between academics and business does not only generate economic value, but also social value that can be reflected in new types of knowledge and new or different ways of working (Spaapen & Drooge, 2011), such as new ways of teaching.

For the development and delivery of novel and entrepreneurial teaching formats, academics engage with external network contacts (Hasanefendic et al., 2016). These novel teaching formats create additional value in the learning experience for students and external actors; hence while often overlooked, the novelty- and value-creating character of these activities justify, and in fact call for them to be regarded as examples of entrepreneurship within the university (Drooge, et al., 2011; Goddard, 2007). Therefore, this cooperation of academics with business within the context of teaching is also a manifestation of academic entrepreneurship.

The question arises as to which factors affect the engagement of educators in UBC within the context of teaching. On the one hand, a series of normative changes have occurred at the organisational and institutional level. Universities have developed a strategic vision encouraging the pursuit of UBC-based teaching (D'Este & Patel, 2007; Grimaldi et al., 2011). This cooperation has also been encouraged through a series of policies and initiatives, such as the 'ET 2020 strategic framework' in which the Council of the European Union addressed the need to enhance creativity and innovation, including entrepreneurship, at all levels of education and training (European Commission, 2012, p.4). These normative changes might be causing cognitive changes among academics, which means that they might be affecting the way academics interpret their role and tasks. On the other hand, academic engagement with external actors is considered to be individually driven and pursued on a discretionary basis (Perkmann et al., 2013). Therefore, this research addresses issues related to both personal cognition and collaboration, to this end, two complementary social theories are applied: Social Cognitive Theory and Social Capital Theory.

4.3 **Theoretical approach**

4.3.1 Social cognitive theory: networking competency of the academic as self-efficacy

The social cognitive theory defines human behaviour as a triadic, dynamic, and reciprocal interaction of personal factors, behaviour, and the social network (system) (Bandura, 1988). The three factors affect each other bi-directionally, people are both products and producers of their environment. A key element in this relationship is the perceptions of individuals. Perceptions are cognitive constructs. They are mental representations of the external environment around individuals, captured through their senses and elaborated in their minds. They represent a subjective interpretation of reality, and therefore do not necessarily reflect objective circumstances (Arenius & Minniti, 2005). However, through perceptions, people acquire information, store it, transform it and use it to accomplish different tasks or exhibit certain behaviours (Bandura, 1989). Lewin's (1951) field theory also emphasises the importance of perceptions in understanding the behaviour of individuals. He defined a field as a " totality of coexisting facts which are conceived of as mutually interdependent" (Lewin, 1946, p.240). A central tenet of this theory is that the "field" includes a person in his or her own "life space" (Lewin, 1951). The life space is only perceptual – that is, it has to be perceived by the individual. The life-space is composed by coexisting factors relevant to the individuals, such as their self-perceptions, needs, wants and desires. Field theory then suggests that an individual's behaviour is a result of the various forces in the life space, exerting their influence over the individual.

The relevance of perceptions (cognitive process) in shaping the individual's entrepreneurial decisions and actions has been stressed elsewhere (Baron, 2004; Krueger et al., 2000), not only at the individual level (Krueger et al., 2000), but also at the aggregate level (Arenius & Minniti, 2005). At the personal level, the cognitive approach emphasises that perceptions (and motivations) affect everything we say or do as human beings (Krueger, 2003). Social cognitive theory highlights that of all the factors that affect human functioning *self-efficacy* is at the theory's core. Self-efficacy is "a judgment of one's ability to organize and execute given types of performances," (Bandura, 1997, p.21). Self-efficacy embodies the perceptions of one's abilities and competencies. According to Bandura (1988-1989), there is a difference between possessing skills and being able to use them. Successfully using one's skills requires a strong belief in one's capabilities to exert control over events in order to accomplish desired goals. Self-efficacy is then the "judgment of one's ability to organize and execute given types of performances," (Bandura, 1997, p.21). Self-efficacy embodies the perceptions of one's abilities and competencies.

Therefore, academics' self-efficacy beliefs on their ability to undertake UBC activities will influence their behaviour (Bandura, 1988), since those beliefs will determine how persistent their efforts to undertake UBC within the context of teaching will be. As such, this research posits that the extent to which academics believe in their own competencies to handle and exploit UBC relationships is related to the extent of development of UBC-based teaching. In this research, the self-belief of the academic with respect to their "networking competency" will be used as "self-efficacy".

The term "competency" is a multidimensional concept that has been described as observable behaviours or sets of skills. Richey et al. (2001, p.31) defined the term "competency" as: *"a knowledge, skill, or attitude that enables one to effectively perform the activities of a given occupation or function…"*. Competence/y/ies is a set of terms widely used in the human resource development domain, for the assessment of people's job performance (Moore, Cheng, & Dainty, 2002).

Sánchez (2011) defines competencies as "a cluster of related knowledge, traits, attitudes and skills that affect a major part of one's job; that correlate with performance on the job; that can be measured against well-accepted standards; and that can be improved via training and development" (ibid, p.241). Competence/y/ies also have regional variations in interpretation, especially between the United Kingdom and the United States (Mitchelmore & Rowley, 2010). Against these variations, Moore et al. (2002) defines *competence* as relating to an area of work, *competency* as behaviours supporting that area of work, and *competencies* as relating to the attributes underpinning these behaviours. Based on Burgoyne (1989) the authors relate "behaviour" to both ability and willingness to act. Under this definition, to be competent means *"to be able to behave effectively in a particular performance domain or activity"*.

Mingling with these definitions of "competency" and "being competent", this research uses the concept of the "networking competency of the academic" and defines it as *"the set of knowledge, skills and attitudes that enables the academic to network effectively within the context of UBC"*. Additionally, to form the construct of "networking competency" this research draws insights from research on entrepreneurial networking to identify the set of knowledge, skills and attitudes that form part of the networking competency of the academics.

McVea & Freeman (2005) argue that entrepreneurs benefit more from their network relationships when they are "aware" of their stakeholders. Freeman (2010) indicated that in order to be a successful networker, stakeholder awareness is essential as it helps individuals to assess to what extent which actors in their existing network might be able to offer specific types of support or access to resources, as well as to what extent the entrepreneur itself is able to understand the needs of the other party. Therefore, part of an academic's networking competency is their ability to understand what business needs and wants, as well as to understand what kind of resources they can offer in return.

The extent to which academics believe that they can do something for external actors within the contexts of education, training and research, is also part of their networking competency, as it conveys credibility in front of external actors. Therefore, part of an academic's networking competency is their belief that they have enough to offer to business within the context of UBC.

Thus, the hypothesis relating to the role of the networking competency of the academic is:

> *Hypothesis 1:* That the academic's perception of their networking competency to undertake UBC activities has a significant effect on the extent of development of UBC-based teaching.

4.3.2 A social capital perspective to depict the social context of the academic

At the aggregate level, social cognitive theory posits that both, potential and existing entrepreneurs capture the influence of the external environment through their perceptions, generating attitudes and intentions, which, in turn, determine behaviours (Arenius & Minniti, 2005). In this study our focus is on the interorganisational arrangements between universities and business that form a networked structure of ongoing social interactions. The components of this networked structure form an academic's immediate environment. Within this environment, it is necessary for academics to perceive opportunities for new value creation in cooperation with external actors as feasible and desirable. Therefore, some cognitive process

(their perceptions) will make some academics more sensitive than others to the different opportunities provided by the environment and the availability of resources for their exploitation (Ardichvili et al., 2003; Shane & Venkataraman, 2000)

While the social cognitive theory is adequate to address how academics' behaviour is affected by their perceptions of their own competencies as well as their environment, it is limited in addressing what components are within this social structure where they are embedded, and how these components could affect the academics' behaviour, necessitating the introduction of an additional theory as the foundation for depicting the social context of the academic. Consequently, the Social Capital Theory is introduced to supplement the Social Cognitive Theory.

The tenet of the Social Capital Theory is that social relationships among people can be productive resources (Coleman, 1990). Social capital is defined as *"… the sum of the actual and potential resources embedded within, available through, and derived from the social contacts of an individual or an organization"* (Nahapiet & Ghoshal, 1998, p.243). Sociologists and organizational scholars identify three highly interrelated dimensions of social capital: the structural dimension, the cognitive dimension and the relational dimension (Granovetter, 1992; Nahapiet & Ghoshal, 1998).

The structural dimension refers to the overall patterns of connections between actors – that is, whom you reach (Burt, 2000). Among the most important facets of the structural dimension is the presence or absence of social interaction between actors (Granovetter, 1992; Tsai & Ghoshal, 1998). A prerequisite for the successful development of UBC-based teaching is the interaction between academics and business. In the wider literature on social capital and networks, it has been documented that individuals who spawn boundaries across different units benefit from timely access to diverse information and the activation of direct contacts amongst otherwise unconnected actors (Burt, 2004). Universities have made an effort to spawn organisational boundaries via activities and structures, which appear to be instrumental in generating proximity between the universities and business (Perkmann et al., 2013). The literature has documented the positive influence of structural mechanisms that can contribute to the development of UBC within the context of education, such as career offices and centres for further learning (Davey et al., 2011), alumni network (Fini et al., 2011) and the appointment of academics to company boards or business people to HEI boards (Wilson, 2012). Additionally, the amount resources dedicated to UBC has been proven to influence UBC success (Phan & Siegel, 2006).

The cognitive dimension of social capital refers to the norms and values associated with the social network (e.g., Coleman, 1990; Portes & Sensenbrenner, 1993; Putnam, 1995). This dimension facilitates a common understanding of collective goals through a shared code and proper ways of acting in a social system (Nahapiet & Ghoshal, 1998). Particularly, in the case of UBC where an inter-organisational cooperation takes place, the lack of common values and a common understanding between both organisations can have an impact on the collaborative process between business and academia (Bruneel et al., 2010; Davey et al., 2016). Therefore, building a common context for this cooperation is important. One mechanism to build a common context is the shared use of common objects and artefacts (Lesser & Storck, 2001). Examples of these objects are the strategic documents and vision statements that encourage and support UBC activities as a central part of the university's mission, which emphasises the desired behaviour (D'Este & Patel, 2007; Grimaldi et al., 2011). These documents and vision statements provide a shared reference point that others can quickly share and understand. At a national level, governments can also shape behaviour among the actors of the social system created by UBC, by designing policies and initiatives

which foster an institution supporting and encouraging UBC for all stakeholders (Ambos, Mäkelä, Birkinshaw, & D'Este, 2008; Geissler, Jahn, & Haefner, 2010; Loi & Di Guardo, 2015).

The relational dimension refers to the quality of relationships between actors (Granovetter, 1992). It can be defined by the assets rooted in those relationships, such as trust (Uzzi, 1996). Knowledge-creation, sharing and use is facilitated through social capital since actors with frequent interaction also have frequent communication, which develops a common understanding and a shared goal. Several studies on UBC have found relational aspects play a significant role in driving this cooperation (Davey et al., 2011b; Plewa & Quester, 2008). Trust, communication and a common understanding are crucial for driving successful UBC. Particularly, UBC-based teaching creates a learning network involving several actors with different views and objectives – the students, the business, the lecturer and the university. The differing objectives and views among different stakeholders imply high levels of uncertainty within the established cooperation (Plewa, 2009). In this case, trust acts as a governance mechanism for embedded relationships (Uzzi, 1996), leading to information and knowledge exchange among academics and business (Bruneel et al., 2010). Constant communication is expected to further the partners' common understanding as it develops a common knowledge platform (Plewa et al., 2013a). Communication creates a foundation for actors of the networked organisational structure to maximise benefits for UBC through the integration of unique sets of knowledge, information and skills (Cummings & Kiesler, 2007). Constant communication would foster the development of a common understanding of each other's needs and expectations. Only with a common understanding can this cooperation be on the behalf of all parties involved. These conditions, in turn, would foster the delivery of quality work that would meet the expectations of all parties involved and foster the further development of such forms of cooperation in teaching.

Although UBC has been encouraged through a wide array of supporting mechanisms, activities and founding options (e.g. Davey et al., 2011b), previous research has found that UBC within the context of education often occurs via personal relationships and is undertaken through informal channels instead of being institutionalised, centrally-managed and controlled (Davey et al., 2011b; Galán-Muros & Plewa, 2016). This situation implies that in the case of UBC-based teaching, relational aspects embodied in the individuals will be more important than structural aspects. In other words, UBC-based teaching is not about the pattern of connections (structural dimension), but instead about the way academics use their contacts (relational dimension). Particularly, when academics enjoy a high degree of freedom in their teaching activities, the strength of their relationships will be more important than the pattern of connections in determining the involvement of external actors in their teaching practices. Additionally, the fact that UBC within the context of teaching takes place at the individual level (Davey et al., 2011b; Perkmann et al., 2013) implies that no further organisational commitment is necessary, suggesting that it is not the values and norms (cognitive dimension) that will determine the engagement of academic's UBC-based teaching, but the quality of the relationships they have with their business contacts. Thus, the hypothesis relating to the role played by the academic's perception of social capital is:

> *Hypothesis 2:* That the academic's perception of the relational social capital for UBC has a significant effect on the extent of development of UBC-based teaching.

4.4 **The mediating effect of the academic's perception of their networking competency**

Social capital theories on entrepreneurship explain how social structures facilitate and constrain opportunities, behaviours, and cognitions of social actors (Tindall & Wellman, 2001). As such, social capital aims at facilitating opportunities for UBC, as well as sending a message to academics that this cooperation is feasible and desired. However, as suggested by social cognitive theory, the academic is not only subject to the environment (organisational and institutional arrangements), but has an active role on the extent of development of UBC-based teaching. Bandura (1993, p.118) stated that, *"…among the mechanisms of agency, none is more pervasive than people's beliefs about their capabilities to exercise control over their own functioning and the events that affect their lives..."*

Therefore, the argument advanced in this research is that *the academic's perception of the relational social capital for UBC (REL) has a significant effect on the extent of development of UBC-based teaching*. However, this relationship is mediated by the *networking competency of the academic (NWC) (See Figure 3)*. This model suggests that the relationship between REL and UBC-based teaching isn't a direct effect, but operates through the networking competency of the academic.

Thus, the hypothesis relating to the mediating role of the networking competency of the academic is:

Hypothesis 3: The link between REL and UBC-based Teaching is mediated by NWC

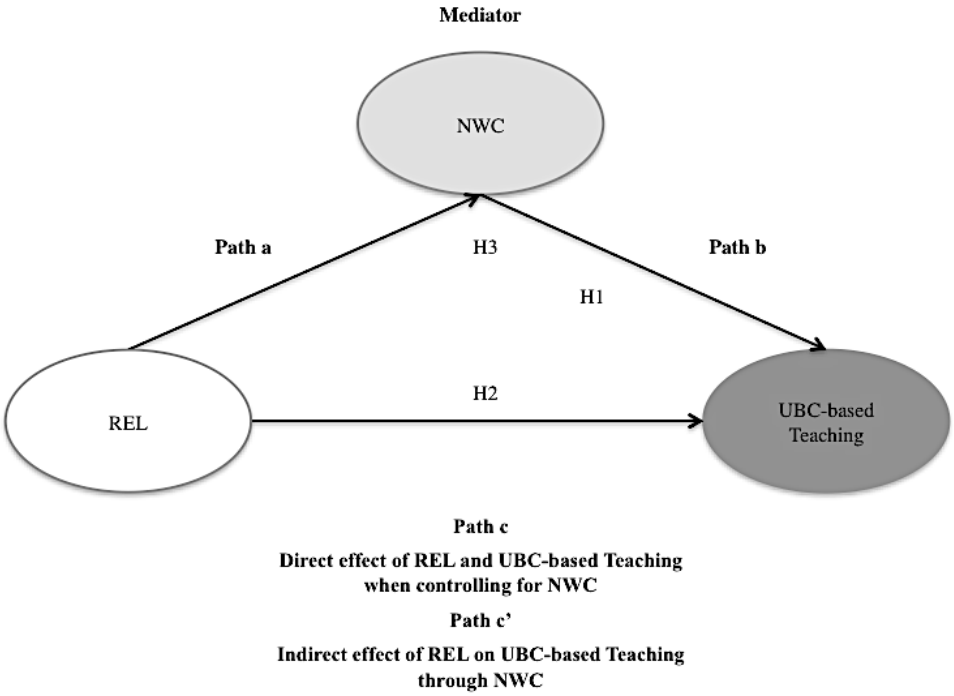


Figure 3. *Simple and mediated models for UBC-based teaching*

4.5 **Methodology**

4.5.1 Sample

The data used in this study was collected in the framework of a European project executed for the European Commission DG Education and Culture (EAC/10/2015). For this study an online questionnaire was created, translated into 33 languages, sent via email to all academics, rectors and UBC managers (in TTOs/innovation office/ incubators directors) of registered HEIs in 33 countries in Europe and the European Economic Area. The questionnaire remained open to access from the 28th of September 2016 until the 30th of November 2016.

From the original data set, only the responses from the academics in Germany were selected. The response sample for Germany was originally n=688. After cleaning the data from *outliers*[2] – observations very different from most others or unusual scores (Field, 2013, p.164) and excluding missing values listwise, the total response sample for this study was n=312 valid responses used for analysis.

4.5.2 Variables

The dependent variable for the study was the "extent of development of UBC-based teaching", a self-assessed variable by the academic on a 10-point scale of 1= "not at all" to 10 = "high". The independent variables related to the dimensions of social capital were constructed with items belonging to the conditions that facilitate the development and execution of the more general concept of UBC, from which UBC-based teaching is described as one form of cooperation (Davey et al., 2011b).

Additionally, the independent variable denominated the "networking competency of the academic" has been also deductively constructed with items belonging to the section denominated "UBC readiness" included in the original questionnaire. A process of variable reduction was undertaken in the form of a factor analysis to create the four scales, as shown in *Table 9* (refer to the Appendix A for factor loadings). Moreover, reliability was confirmed as the Cronbach's α for all constructs lies well above the .7 threshold, also provided in the Appendix A.

[2] Outliers were defined using the Mahalanobis distance, Cook's distance and Centred leverage value.

Table 9: Independent variables

Construct	Scales	Mean	Variables
Social Capital	1. Conditions related to structural social capital* *(Cronbach's α = .780)*	4.66	▪ UBC activities aimed at academics to interact with business people ▪ UBC activities aimed at students to interact with business people ▪ Offices and personnel dedicated to UBC (incl. technology transfer office, incubator, career office) ▪ University resources (e.g. buildings, founding, equipment)
	2. Conditions related to cognitive social capital* *(Cronbach's α = .731)*	5.50	▪ Commercial orientation of the university (which is expected to be part of a common understanding with business) ▪ A university mission, vision, plans and communication embracing UBC ▪ National/Regional policies on education supporting UBC ▪ National/Regional policies on research supporting UBC
	3. Conditions related to relational social capital* *(Cronbach's α = .776)*	8.10	▪ Existence of mutual trust ▪ Existence of mutual commitment (trustworthiness of the actors) ▪ Prior relation with the business partner ▪ Existence of a shared goal
Self-efficacy	4. Networking competency of the academic** *(Cronbach's α = .789)*	3.64	▪ I have sufficient knowledge of what business need and want ▪ I have sufficient skills and knowledge of UBC generally (including the procedures and processes) ▪ I have a lot to offer to business in education and training ▪ I have a lot to offer to business in research ▪ I have the capability to transfer / exchange knowledge and technology to / with business

*Independent variable means scale: 1= 'not at all', 10 = 'high'
**Independent variable means scale: 1= 'strongly disagree', 5 = 'strongly agree'

Control variables

This research has controlled for "type of university"[3], a variable deemed to have an impact in previous studies (see *Table 10*). Not all universities offer the same opportunities and resources for academics, and polytechnics and universities of applied sciences are said to be closer and more engaged with industry. In the same vein, these types of universities usually have more developed technology transfer policies than traditional universities (e.g. basic science) (Perkmann & Salter, 2012).

With respect to academic discipline and area of knowledge, applied fields have stronger ties with business compared to fields from the basic science area (Arvanitis, Kubli, & Woerter, 2008; Meyer-Krahmer & Schmoch, 1998). Disciplinary affiliation has been found to be an important variable informing engagement with industry (Bekkers & Freitas, 2010). Applied fields of research, such as engineering, make collaboration or engagement in entrepreneurial activities more likely than other fields (Bekkers & Freitas, 2010; Bozeman & Gaughan, 2007; Boardman & Ponomariov, 2009). Based on this evidence, it has also been controlled for the variable "area of knowledge"[4], these being *engineering, medical sciences, natural sciences, social sciences and other (see Table 10)*.

Base-groups for the dummy variables have been determined based on the recommendations from Field (2013, p.432). The base-group for "type of university" has been determined to be "university of basic science" due to having a fairly large number of cases to ensure that the estimates of the regression coefficients are reliable. The base-group for "area of knowledge" has been determined to be "engineering" also due to the fairly large number of cases, and to the fact that the condition is usually deemed to have an influence in the engagement of academics with industry; therefore this group acts as a reference for other "areas of knowledge".

[3] Originally, the variable "type of university" included the following categories: university of basic science (base group after coding for dummy variables), university of applied sciences, polytechnic / technical university, school of arts, college of education and other. When performing the analysis, the categories "school of arts", "college of education" and "other" from the variable "type of university" were excluded from the analysis due to a lack of responses.

[4] Originally, the variable "area of knowledge" included the following categories: engineering (base group after coding for dummy variables), arts, formal sciences, humanities, medical sciences, natural sciences, social sciences and other. When performing the analysis, the categories "arts" and "humanities" were also excluded from the analysis due to a lack of responses

Table 10: Sample characteristics regarding the control variables included in the analysis

Type of university	
Basic sciences	99
Applied sciences	186
Polytechnic / Technical university[5]	27

Area of knowledge	
Engineering	104
Medical sciences	24
Natural sciences	23
Social sciences	82
Other	79

4.6 **Results**

In this section, the results of the study are presented. Firstly, the *Table 11* below presents the correlations between variables, providing preliminary evidence towards some of the hypotheses. Secondly, in order to determine the influence of the academics' perception of the relational dimension of social capital for UBC, as well as their perception about their networking competency on the extent of development of UBC-based teaching, a hierarchical (blockwise entry) multiple linear regression analysis was made via SPSS v24, using the t-value and significance to determine effect at a 95% confidence ($p<0.05$), and the standardised beta value to determine direction of the influence of the experimental and control variables (see *Table 12*). Additionally, the R^2 was determined to test the ability of the control and independent variables to explain the extent of development for UBC-based teaching as perceived by the academic. *Table 12* shows the beta values and the standardised beta values of the control and independent variables for the multiple linear regression analysis.

Table 11: Correlation matrix on the main variables

	Mean	**SD**	**1**	**2**	**3**	**4**
1. UBC-based teaching	4.33	2.82				
2. Structural social capital	4.66	2.11	.157**			
3. Cognitive social capital	5.50	2.04	.170**	.410**		
4. Relational social capital	8.10	1.50	.194**	.078	.189**	
5. Networking competency of the academic	3.64	0.67	.232**	.012	.087	.229**

**Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

[5] Referred to as Technische Universität (TU) in the German system of higher education. It is a type of university usually focused on engineering sciences, but often has faculties of economics and can also offer units of cultural and social sciences and arts. These institutions can grant *habilitation* and doctoral degrees and focus on research.

For Model 1, the predictors account for 10.9% *(R^2 = .109)* of the variation in the extent of development of UBC-based teaching. However, when *relational social capital* and *networking competency* of the academic are added as variables in Model 2, this value increases to 18.5% of the variance in the extent of development of UBC-based teaching *(R^2 = .185)*. Therefore, the results confirm our hypotheses 1 and 2 where relational social capital, *b = .245, p = < .05* and networking competency of the academic, *b = .661, p = < .01* significantly predict the extent of development of UBC-based teaching.

Supporting our main hypothesis, the academic's perception of the structural and cognitive social capital played no significant role in the extent of development of UBC-based teaching. Additionally, with respect to the control variables at the organisational and institutional level, the results of the regression analysis show that the variables "type of university" and "area of knowledge" matter in the extent of development of UBC-based teaching. Furthermore, they shows that being part of a "university of applied sciences" and/or "polytechnic / technical university" and being an academic in the "social sciences" matters and that these are significant variables in both tested models (Model 1 and Model 2).

This means that the extent of UBC-based teaching increases significantly among academics belonging to "universities of applied sciences" and "polytechnics / technical universities", compared to those belonging to "universities of basic sciences" (baseline group for the dummy variables). Likewise, the extent of UBC-based teaching increases significantly among academics belonging to "social sciences", compared to those belonging to "engineering" (baseline group for the dummy variables).

Table 12: Summary of hierarchical regression analysis for variables predicting UBC-based teaching (N=312)

Dependent variable	UBC-based teaching					
Mean[+]	4.33					
	Model 1			Model 2		
Variable	*b*	*SE B*	*β*	*b*	*SE B*	*β*
Type of university						
Basic sciences[++]						
Applied sciences	1.034	0.383	.180**	.913	.370	.159**
Polytechnic/Technical university	1.803	0.625	.180**	1.356	.611	.135*
Area of knowledge						
Engineering[++]						
Medical sciences	-1.385	0.683	-.131*	-1.158	.660	-.110
Natural sciences	-.737	0.642	-.068	-.522	.622	-.048
Social sciences	0.835	0.404	.130*	.934	.391	.146*
Other	-0.339	0.402	-.052	-.288	.388	-.044
Structural social capital				.121	.077	.091
Cognitive social capital				.106	.081	.077
Relational social capital				.245	.102	.130*
Networking competency of the academic				.661	.226	.159**
R^2			**.109**			**.185**
Adj. R^2			**.092**			**.158**

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed)
[+] Dependent variable means scale: 1= 'not at all', 10 = 'high'
[++] Base group from dummy variables

4.6.1 Results on the mediation analysis

In order to test for mediation effect of the "networking competency of the academic (NWC)" on the relationship between "the academic's perception of the relational dimension of social capital for UBC (REL)" and the extent of development of "UBC-based teaching", a mediation analysis was made using the PROCESS plug-in in SPSS v24 using Model 4 (Field, 2013; Hayes, 2012). To demonstrate this mediation effect, four conditions must hold:

- The predictor variable (REL) must significantly predict UBC-based teaching in the first place (path c)
- The predictor variable (REL) must significantly predict NWC (path a)
- NWC must significantly predict UBC-based teaching (path b)
- The relationship between the predictor variable (REL) and UBC-based teaching must be smaller when NWC is included in the model than when it is not (path c').

In order to determine that the four assumptions for mediation have been met, the regression coefficients for each path have been reported, as well as the indirect effect values, using the bootstrap confidence intervals (BCa CI) as well as the significance associated with this confidence interval at a 95% confidence ($p<0.05$) (see *Figure 4*).

Table 13 demonstrates that all four conditions are met for the relationship between REL and UBC-based teaching with mediation effect from NWC. First, REL significantly predicts UBC-based teaching (path c) b=0.3576, p=0.0002, $R^{2=}$0.0412. Second, REL has a significant positive impact on NWC (path a) b=0.0859, p=0.0002, R^2=0.0407. Third, NWC does have a significant positive impact on UBC-based teaching (path b) b=0.9639, P=0.0000 and REL does significantly impact UBC-based teaching (even with NWC in the model) (Path c'). The overall model when the mediator is included yields to an R^2 of 0.0934. Finally the fourth condition has been met by demonstrating that the effect of REL on UBC-based teaching with NWC included as a predictor is smaller (b=0.2747, p=0.0034) than when it is not (b=0.3576, p=0.0002).

Based on these results, it is possible to confirm that there was a significant indirect effect of **REL** on **UBC-based teaching** through **NWC**, **b= 0.0828**, **BCa CI [0.0282, 0.1447].** This represents a relative small but significant effect, (Completely standardised indirect effect **b= 0.047, 95% BCa CI [0.0176, 0.0830]).** This indirect effect represents 5% of the maximum value that it could have been, which is a fairly small but meaningful mediation effect of NWC in the relationship between REL and the extent of development of UBC-based teaching.

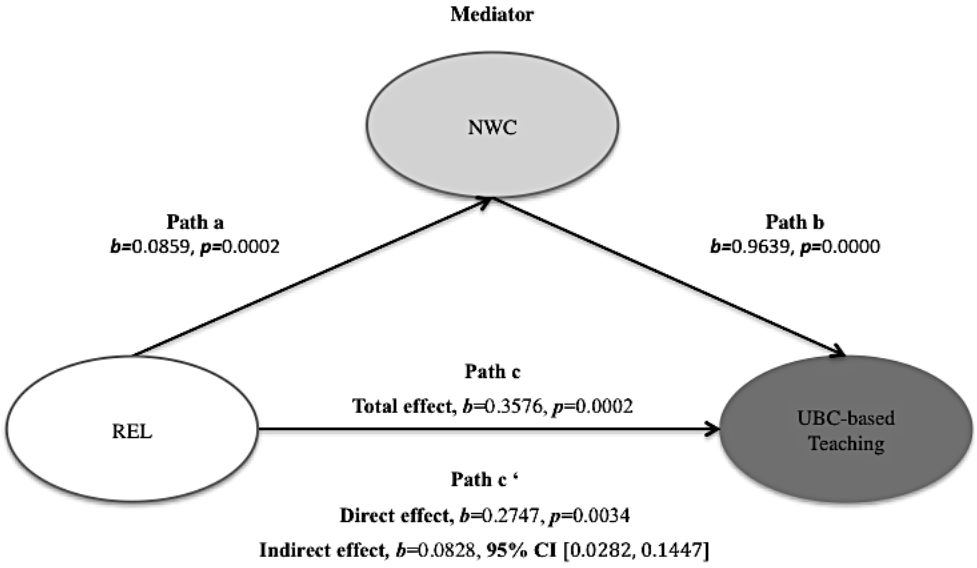


Figure 4: *Graphical representation of the mediation model of* ***REL*** *as a predictor of* ***UBC-based teaching****, mediated by* ***NWC****. The confidence interval for the indirect effect is BCa bootstrapped CI based on 1000 samples.*

Table 13: Results of the mediation analysis tested for REL and UBC-based teaching with NWC as mediator

	Predictor	Relational social capital for UBC (REL)			
	Outcome variable	UBC-based teaching			
	Mediator	Networking competency of the academics (NWC)			
		b	***t***	***p***	***R^2***
Four conditions of mediation	**REL** significantly predicts **UBC-based teaching (Path c)**	0.3576*	3.8178	0.0002	0.0412
	REL significantly predicts **NWC (Path a)**	0.0859*	3.7906	0.0002	0.0407
	NWC significantly predicts **UBC-based teaching (Path b)**	0.9639*	4.4110	0.0000	0.0934
	REL significantly predicts **UBC-based teaching** *(even with **NWC** in the model)* **(Path c')**	0.2747*+	2.9504	0.0034	
Mediation effects	**Total, Direct and Indirect effects**				
		b	***t***	**LLCI**	**ULCI**
	Total effect of **REL** on **UBC-based teaching**	0.3576*	3.8178	0.1733	0.5418
	Direct effect of **REL** on **UBC-based teaching** with **NWC** included as a predictor	0.2747*+	2.9504	0.0916	0.4579
				BootLLCI	**BootULCI**
	Indirect effect of **REL** on **UBC-based teaching** via **NWC**	0.0828*++	NA	0.0282**	0.1447**
	Completely standardized indirect effect				
				BootLLCI	**BootULCI**
	Complete standardized effect of **REL** on **UBC-based teaching** via **NWC**	**0.0470**	NA	0.0176**	0.0830**
	Normal theory tests for indirect effect				
			z	***p***	
	Indirect effect of **REL** on **UBC-teaching** via **NWC**	**0.0828*++**	2.8333	0.0046	

*Significant at the p=<0.05 level

** The confidence interval for the indirect effect is 95% BCa bootstrapped CI based on 1000 samples.

+ The relationship between **REL** and **UBC-based teaching** is smaller when **NWC** is included in the model than when it is not (Path c).

++Indirect effect is significantly reduced when **NWC** is included in the model

Table 14: Summary of hypotheses results

Hypotheses	Indep. Variable	Dep. Variable	Result of hypotheses
H1: That the academic's perception of their networking competency to undertake UBC activities has a significant effect on the extent of development of UBC-based teaching	Networking competency of the academic	Extent of development of UBC-based teaching	Supported (See *Table 12*)
H2: That the academic's perception of the relational social capital for UBC has a significant effect on the extent of development of UBC-based teaching.	Conditions related to relational social capital	Extent of development of UBC-based teaching	Supported (See *Table 12*)
H3: The link between REL and UBC-based Teaching is mediated by NWC.	Conditions related to relational social capital (REL) **Mediator:** The networking competency of the academic (NWC)	Extent of development of UBC-based teaching	Supported (See *Figure 4* and *Table 13*)

4.7 **Discussion of the results**

The results presented in *Table 12* confirm previous findings that regard UBC-based teaching as an activity highly driven by the individual initiative of academics (Davey et al., 2011b; Galan-Muros, 2016; Perkmann et al., 2013). In this research, UBC-based teaching is positively impacted by the academics' perception on the conditions related to relational social capital, as well as their perceptions on their own networking competency as self-efficacy. The results provide strong support for Hypothesis 1, confirming that relational aspects for UBC are not only important for research-based cooperation, but also for an education-based one.

Extending the findings from Plewa (2009), Plewa et al. (2013), Davey et al. (2011b) and Galán-Muros and Plewa (2016) on the importance of relational aspects for UBC, this study shows that self-efficacy of academics with respect to their networking competency to undertake UBC activities, plays an important and highly significant role, not only in the extent of development of UBC-based teaching; but also, in respect to the relational aspects that drive this cooperation. The mediating role of the academics' self-efficacy with respect to their networking competency suggests that the role of relational aspects as key drivers for

UBC could be further explained by the academics' perception of their self-efficacy in respect to their networking competency for conducting UBC activities. In practice, it means that academics' self-efficacy is positively related to the strength of relationships within the context of UBC-based teaching.

The fact that the academics' self-efficacy with respect to their networking competency accounts for 16% of the variance in the extent of development of UBC-based teaching, suggests that having a high perception of one's networking competency (high self-efficacy) will lead to better outcomes in regards to UBC in teaching.

In accordance with our previous expectations, the role played by the structural and cognitive dimensions for social capital was not found to have a significant impact on the extent of development of UBC-based teaching. This result confirms that UBC-based teaching and the extent of its development is driven by individuals and that it is the quality and strength of relationships with business contacts that matter, rather than the pattern of connections or the values and norms.

Additionally, it also suggests that UBC-based teaching can be influenced by factors other than the documented UBC facilitators and supporting mechanisms in this study. This explanation seems highly plausible since it has been stated that interactions between academics and business in relation to curriculum design and delivery, has received very little academic attention (Davey, 2015; Plewa et al., 2015), therefore it could be that the academic literature as well as policy level documents have not yet captured the complete nature of UBC-based education.

4.8 **Conclusions**

Academics' perceptions of the conditions related to relational social capital as well as their self-efficacy in respect to their networking competency, positively relate to the extent of development of UBC-based teaching. This research contributes to an overall conceptual understanding of the nature and the importance of perceptions from individuals in social capital effectiveness. This impacts not only in the extent of UBC-based teaching, but also on the difference in the way relational aspects of social capital can affect the extent of development of UBC-based teaching.

4.8.1 Theoretical implications

From a theoretical perspective, the findings of this research imply that relational aspects for UBC alone are important but insufficient in explaining the engagement of academics with business in teaching. The academics' perception in regards to the relational dimension of social capital can contribute to the development of UBC-based teaching to some extent, but it is the self-perception of the academics' ability to undertake such cooperation (academics' self-efficacy) that leads to a greater level of development of UBC-based teaching. By identifying the academics' perception of the relational dimension of social capital as a determinant factor for UBC-based teaching, strong and quality ties between academics and business people are characterized as a valuable resource for cooperation within the teaching mission of the university, beyond the immediate exchange of deficient resources. Further, by determining the academics' perception of their networking competency as an important determinant for UBC within the context of teaching, the self-efficacy of the academics as well as their networking behaviour becomes crucial in determining the quality and strength of those networked relationships that will foster the further development and implementation of novelties in teaching in cooperation with business.

Particularly, by stating the important role of self-efficacy of the academic, this research extends the optimistic view on UBC that has focused on the role of "drivers" (e.g. Barnes et al., 2002; Davey et al., 2011b; Galan-Muros, 2016; Galán-Muros & Plewa, 2016; McNichols, 2010) instead of "barriers" to undertake UBC activities. According to social cognitive theory, people with high self-efficacy beliefs tend to master tasks, whereas those with low self-efficacy tend to focus on what could go wrong (Bandura, 1988). Therefore, the academics' beliefs in how competently they can undertake UBC activities in teaching will determine the level of effort they exert towards overcoming obstacles and accomplishing behaviours, such as their engagement with business.

Finally, the results concerning the significant role of the self-efficacy of the academic with respect to his or her networking competency portrays the engagement in collaboration for UBC-based teaching as a planned behaviour (Ajzen, 1991). Therefore, in line with the literature on entrepreneurial networking (e.g. Stam, 2015; Vissa, 2011, 2012), academics can also be considered strategic actors in the search for valuable contacts and resources for the innovation of teaching practices. This finding has theoretical implications for social capital and entrepreneurial networking theories that usually portray the structure and quality of networks as the dominant explanation of network effectiveness; yet by portraying collaboration and networking in general as a planned behaviour, academics become reflective agents who endogenously decide on, and are practitioners of networking practices that shape their collaborations and, at the end of the day, their social capital.

4.8.2 Managerial implications

Managers of universities interested in developing and sustaining UBC within the context of teaching should develop strategies and mechanisms that not only encourage interaction between academics and business people, but that focus on the strength and quality of these relationships. For example, a key point of attention should be to assure the quality of the outcome for the business participating in the teaching practice; examples of practices delivering quality outcomes to real companies are documented in Baaken et al. (2015) and in Baaken and Rossano (2017). Assuring quality in the outcomes for business sends a message that academics are trustworthy actors, who will develop trust among business people.

According to social cognitive theory, people behave as they do because of the mutually interacting influences of their environment, their behaviours and their thought processes. This premise suggests that top-down approaches that encourage the interaction of academics with business people would not be successful without incorporating the people enacting such cooperation, namely the academics and students. Moreover, even though it has been recognized that UBC within the context of teaching is an individual initiative, such top-down approaches need to target the reinforcement of desired behaviours, such as when academics are proactively establishing collaborations in teaching. These approaches help to shape academic's self-beliefs about their abilities to perform desired behaviours.

Finally, besides innovating and implementing motivation strategies for engaging academics in UBC, this research has demonstrated that behaviour and the environment enjoy a bidirectional relationship thereby it can be developed through coaching of managers (Wakkee, Elfring, & Monaghan, 2010). In this respect, it calls for innovative practices among human resources managers in HEIs.

4.8.3 Limitations

The present study has certain limitations. A possible limitation of this study concerns self-reporting data collection with regards to the dependent variable, which may lead to biases. In future studies, researchers might consider developing a more objective measure for UBC-based teaching.

Notwithstanding the mediation effect, interpreted as an indirect effect of 5% of the maximum value that it could have been; this mediation effect is highly significant but relatively small. Future studies should look to include other potential mediators in the model, in addition to the networking competency of the academic. However, as this study aimed at proving a mediation relationship and not at forecasting, the significance of the mediation effect has been enough to confirm hypothesis 3.

4.8.4 Implications for further research lines

Prior research (De Silva, 2012; Galán-Muros & Plewa, 2016) suggests that these forms of cooperation in teaching could be considered a process whereby academics start or intensify their entrepreneurial engagements that help to establish a network of contacts with businesses. Likewise, Galán-Muros and Plewa (2016) recommends focusing initial engagement with businesses in the education context, before engaging in activities that may be more challenging due to a higher degree of risk involved, such as in the case of research-based collaborations. This approach is thought to develop the drivers critical for all UBC activities. This developmental view calls for further longitudinal research. Further research could observe the changes in the academics' perception of social capital and self-efficacy regarding their competencies in undertaking UBC and consider how these changes in their perceptions affects the extent of development of the general concept of UBC.

Additionally, the findings of this research posed an interesting question: how is social capital created and accumulated within the general concept of UBC, and particularly within the context of education? For example, Tsai & Ghoshal (1998) suggested that organizational attributes might influence the creation and accumulation of social capital in the organizational setting. Later studies should explore what factors influence the development of conditions related to social capital within the context of UBC-based teaching.

In regards to the regression model, the control variables play a significant role in explaining the extent of development of UBC-based teaching. In line with previous findings (Perkmann & Salter, 2012), being an academic in a university of applied sciences and/or polytechnic or technical university is significant for UBC-based teaching. The significant role played by the variable "area of knowledge", confirms previous hypotheses in the literature stating that the social sciences might be using other mechanisms to transfer knowledge, such as education-based UBC (Benneworth & Jongbloed, 2010; Wakkee et al., 2015). However, further research should use the variable "area of knowledge" as an experimental one in order to confirm its role on the extent of development of UBC-based teaching.

Acknowledgements

Many thanks to Prof. Dr. Peter van der Sijde for his valuable contribution in the realisation of this study. Also to Prof. Dr. Todd Davey for facilitating access to the data within the framework of the European project EAC/10/2015 - "University-business cooperation in Europe: drivers, challenges, and opportunities" and also to the DG Education & Culture from the European Commission for their funding on this study which contributed to this work.

Chapter 5 Academic entrepreneurship in the context of education: the role of the networking behaviour of academics[6]

Abstract

This qualitative study extends literature on academic entrepreneurship and entrepreneurial networking by examining how academics, in their role of entrepreneurial educators, network for the creation and execution of novel teaching practices in cooperation with external actors. Considering evidence from eight case studies conducted in Mexico and West Europe we found that the networking behaviour of entrepreneurial educators is crucial for the generation of proximity with external actors and for the acquisition of key resources. The entrepreneurial and industrial experience of entrepreneurial educators emerges as an affordance to network with external actors, helping them to achieve a common understanding of the opportunity and to generate trust among them. This study equips managers of higher education institutions with critical insights into innovating the teaching mission of the university and developing closer and stronger relationships with external actors of the university. The propositions presented in this study regarding the different networking actions of the entrepreneurial educators uncover notable theoretical and managerial implications and offer some key research directions.

[6] Chapter co-authored with Dr. Ingrid Wakkee

Rossano-Rivero, S., & Wakkee, I.A.M. (2018). Academic entrepreneurship in the context of education: the role of the networking behaviour of academics. Journal of Science and Technology Policy Management, https://doi.org/10.1108/JSTPM-03-2018-0034.

5.1 **Introduction**

In recent years a stream of literature has stressed the relevance of instilling the idea of entrepreneurship in universities and particularly among academics; a phenomenon that has been conceptualised as academic entrepreneurship (Rothaermel et al., 2007). To date, academic entrepreneurship is usually understood as the commercialisation of research via spin-offs, licenses and patents while entrepreneurial forms of education, in which knowledge circulation with external organizations plays a central role, are generally overlooked. Hence, this study focuses on how academics, in their role of educators (further referred to as "entrepreneurial educators"), network for the creation and execution of teaching practices in cooperation with external actors in order to create novel approaches in teaching.

Accordingly, we respond to Perkmann et al.'s call (2013) to put academia's education-driven engagement with external actors higher on the research agenda, contributing to the literature in several ways. Firstly, it shifts the attention away from academic entrepreneurs as merely founders of spin-offs and collaborators with business on research and development (Clarysse et al., 2011; Klofsten & Jones-Evans, 2000) towards entrepreneurial educators who see opportunities in establishing collaborations with external actors as part of their teaching activities.

Secondly, this study examines academic entrepreneurship from a "social networking perspective" (D'Este et al., 2012; Perkmann et al., 2013). Relatively few studies have focused on actual networking behaviour. Some noticeable exceptions are the studies of Vissa (2012) and Stam (2015) who introduced this perspective as a logical extension to the study of the generation of entrepreneurial social capital. These studies focus on how entrepreneurs network, construct and leverage social contacts to reach entrepreneurial goals. The present study introduces this line of research into the area of academic entrepreneurship and examines the different networking actions deployed by entrepreneurs in this context.

The empirical investigation is based on a qualitative inquiry (Denzin & Lincoln, 2011) consisting of eight cases of entrepreneurial educators collaborating with non-academic external actors within the context of undergraduate teaching in the domain of entrepreneurship, innovation, marketing, and management. These cases consist of interviews with the entrepreneurial educators, documentation about their courses, site visits and testimonies of their peers.

The remainder of this paper is organized as follows: Section 2 introduces the key concepts and details of the conceptual background of this study. Section 3 presents the methodological approach taken in the present study, while Section 4 presents the findings of the investigation. We end this paper with a conclusion and needs for further research section.

5.2 **Conceptual background**

5.2.1 Academic entrepreneurship within the context of education: A social networking perspective

Entrepreneurship within the university context is often regarded as a synonym of commercialisation of scientific research via patents and spin-off formation (Shane & Stuart, 2002). However, the start-up perspective does not fully represent all forms of entrepreneurship, neither do patents and spin-off formation capture the full academic entrepreneurship spectrum. Stevenson and Jarillo (1990) define entrepreneurship as *"The process by which individuals - either on their own or inside organizations - pursue*

opportunities without regard to the resources they currently control" (p. 23), academic entrepreneurship thus concerns the various modes of actions undertaken by academics to pursue opportunities for new value-creation within the university through the introduction of novelties in teaching.

In this respect, education-driven collaboration between academics and external actors can be equally important, both in terms of prevalence and economic impact. Previous studies have shown that collaboration in education with external actors, such as business, enriches education (Forsyth et al., 2009; Plewa et al., 2015) as it enhances students' employability skills (Baaken et al., 2015; Kiel, 2014). Hence, while often overlooked, the novelty and value-creating character of these activities justify, and in fact call for such activities to be regarded as examples of academic entrepreneurship (Goddard, 2007; Spaapen & Drooge, 2011).

To understand how such examples of academic entrepreneurship unfold, they are conceptualized in terms of the entrepreneurial process model (see *Figure 5*) developed by Van der Veen and Wakkee (2006). They visualized the entrepreneurship process as entailing three sub-processes: opportunity recognition, opportunity development and opportunity exploitation. The recognition of opportunities involves the development of initial ideas into more refined conceptualizations of new combinations. Within the university context, it entails the identification of needs among stakeholders of the university and the search for opportunities to circulate knowledge with external actors of the university. Once ideas are defined, entrepreneurial educators must secure and orchestrate resources in the development stage (Hitt et al., 2011) and create an "organization" to realise novelties in teaching.

When entrepreneurial educators seek to introduce a novel teaching approach that deviates from the traditional teaching at the university, gaining legitimacy is an essential resource to succeed. Suchman, (1995, p. 574), defines legitimacy as *"a generalised perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs and definitions"*. He categorizes legitimacy using three primary dimensions in organizational legitimacy: pragmatic legitimacy, based on audience self-interest, moral legitimacy, based on normative approval and cognitive legitimacy based on comprehensibility and an organization's practices being taken for granted (Suchman, 1995). In the university context, entrepreneurial educators need to convince their different stakeholders that they will also obtain value of a novel teaching practice that is conducted with external actors, before they can engage in the actual "exploitation" of the opportunity or delivery of their course.

As is shown in *Figure 5*, the entrepreneur (or entrepreneurial educator in the current context) is the driver of this process. At the same time the institutions and networks in which he or she is embedded are of critical importance to success or failure. These institutions and networks are channelling and directing, stimulating and or hindering the entrepreneur (Aldrich & Zimmer, 1986) by providing (or in some cases withholding) access to ideas, resources, moral support and legitimacy throughout the entrepreneurial process. This embedded view on entrepreneurship contrasts with the still dominant perspective of the entrepreneur as a "solo-hero" (Schoonhoven & Romanelli, 2009) but is gaining ground within the literature (Anderson, Drakopoulou Dodd, & Jack, 2012; Hoang & Yi, 2015; Jack & Anderson, 2002).

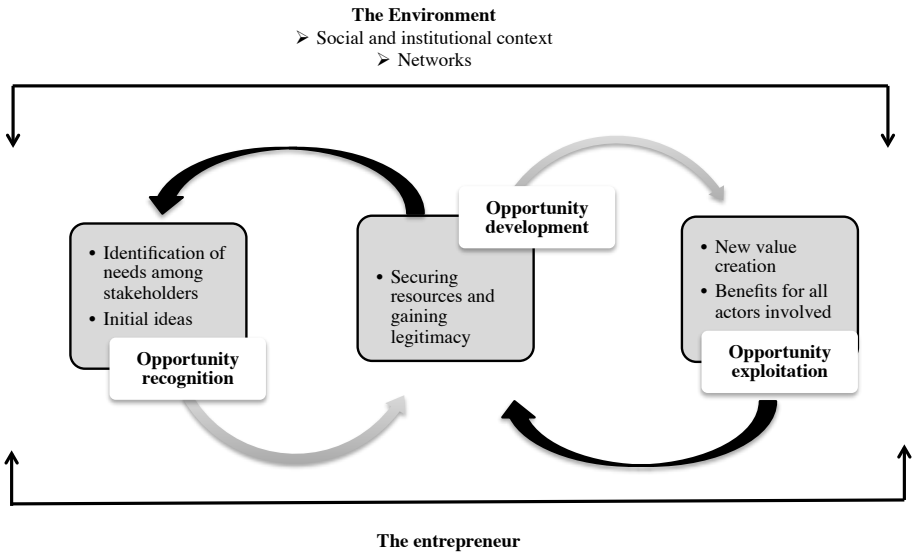


Figure 5. The entrepreneurial process (adapted from Van der Veen & Wakkee, 2006)

Against this background, the pursuit of opportunities by entrepreneurial educators is performed within and through relationships with stakeholders in the social and institutional context. Hence, in this broader understanding, the central notion of academic entrepreneurship is the creation of value from activities of entrepreneurial educators (D'Este et al., 2012), achieved via the interaction with others. This may involve not only economic but also social value that can be reflected in new types of knowledge and novel ways of teaching.

5.2.2 Networking actions conforming the networking behaviour of entrepreneurs

It is increasingly recognized that entrepreneurs are dependent on their social capital to pursue opportunities (Gedajlovic et al., 2013).). While networks are the sets of actors with whom an entrepreneur is connected via ties (Kilduff & Tsai, 2003), social capital constitutes *"the sum of the actual and potential resources embedded within, available through, and derived from the social contacts of an individual or an organization"* (Nahapiet & Ghoshal, 1998, p. 243). Jack and Anderson (2002) proposed an alternative terminology for this phenomenon of social capital - "networking" capital - because it captures the essence of a relational phenomenon. This terminology in fact recognizes that a community of any nature is in fact a series or set of relationships that have to be formed by the creation of ties between individuals.

In a similar fashion, the networks from entrepreneurial educators that foster social capital do not appear out of the blue; rather entrepreneurial educators need to enact their social capital by actively working on their network. Such networking behaviours have hitherto received only limited attention in literature and empirical studies in particular are scarce (De Janasz & Forret, 2008; Forret & Dougherty, 2004; Stam, 2015). Thus, following Forret and Dougherty (2004, p.420) "networking behaviour" represents "*the individuals' attempts to develop and maintain relationships with others who have the potential to assist them in their work or*

career". The above definition of networking behaviour also describes building relationships with others who have the "potential" to assist individuals in their work or career, whether or not assistance is ever provided (Forret & Dougherty, 2004).

Throughout the journey of entrepreneurial endeavours, entrepreneurs adopt certain behaviours, such as "networking". According to Vissa (2012, p.4), the networking actions exhibited by entrepreneurs are defined as behavioural repertoires in the formation and management of interpersonal ties. For her part, Stam (2015) refers to these networking actions as networking practices whereby entrepreneurs not only form and manage interpersonal ties, but also organize their social accessibility to make themselves available for contact. These networking actions to make themselves socially available are conceptualized by Stam (2015) as "proximity mechanisms". In summary, the way in which entrepreneurs form and manage interpersonal ties, as well as the way in which they make themselves socially available, conforms to the networking behaviour of entrepreneurs. In order to explore the networking behaviour of entrepreneurial educators, the work of Stam (2015) and Vissa (2012) will serve as a basis to explore how entrepreneurial educators network with persons, both inside and outside their organizations, who have the potential to assist them in the creation of a novel teaching practice in cooperation with external actors.

5.2.2.1 Proximity mechanisms

Forret and Dougherty (2001) state that social accessibility is a specific dimension of the social networking practices of individuals. Stam (2015) explains that entrepreneurs organise their social accessibility through "proximity mechanisms" and introduces the concept of "affordances" (p.113) to explain how individuals use their physical and digital opportunities to network. On the one hand, examples of "physical networking affordances" include attendance of meetings, seminars, exhibitions, conferences and conventions (Carrasco et al., 2008). Stam (2008) includes "exposure routines", such as the organization of exhibitions and participation in publishing and/or political activities, as elements of community participation. Exposure routines are assumed to offer more accessibility to stakeholders, as they increase the frequency of communication between the entrepreneur and the potential network relationships (Stam, 2015).

On the other hand, examples of "digital networking affordances" are the use of social digital media, such as LinkedIn, Facebook, Research Gate, and others for networking purposes. These technologies in the digital space facilitate the activity of networking for entrepreneurs (Kaplan & Haenlein, 2010), making strategic use of virtual embeddedness (Fowler, Lawrence, & Morse, 2004). Therefore, social practices using digital technologies support entrepreneurs in the strategic exposure of their ventures.

Within the context of the university, the lack of awareness of the academics and external actors' existence has been identified as a structural barrier (Barnes et al., 2002; Mitton, Adair, McKenzie, Patten, & Perry, 2007; Plewa et al., 2013a). In order to navigate this barrier, entrepreneurial educators need to organize their social accessibility and achieve proximity with external actors, from both physical and digital interactions, to connect to their network and reach their goals.

5.2.2.2 Strategic intent and stakeholder awareness

When it comes to approaching new or existing contacts, according to Stam (2015), successful entrepreneurs further exhibit a "strategic intent". The entrepreneur establishes the relationship on the basis of established objectives on how she or he can benefit from a relationship. Whereas this author suggests that entrepreneurs adopt a more or less conscious and strategic

approach to networking, the literature also mentions that some individuals network in a very ad hoc manner without a clear objective (Vissa, 2012). Some entrepreneurs attempt to expand their network only for the sake of network growth (Batjargal, 2010; Vissa, 2011).

Closely related to having a strategic intent, "stakeholder awareness" is a key competence in being a successful networker. McVea and Freeman (2005) indicated that stakeholder awareness is essential, as it helps individuals to assess to what extent which actors in their existing network might be able to offer specific types of support or access to resources, and to understand how stakeholders themselves can benefit from participating in such a relationship with the entrepreneur. According to Stam (2015), stakeholder alignment in opportunity development is at the root of the entrepreneurial task of venture legitimization, which facilitates collective learning of the innovations at hand.

For entrepreneurial educators, stakeholders are any group or individual who can affect, or is affected by, the achievement of the objectives of the teaching practice, mainly the students and the external actors. Within the context of the execution of a teaching practice in cooperation with external actors, the awareness of how external actors can benefit from participating in such a teaching practice would be essential for its successful execution. Several studies have found that, if expectations between both parties are coordinated, a shared goal can be achieved when universities and business enter into cooperation, (Barnes et al., 2002; Bekkers & Freitas, 2010; Bruneel et al., 2010) and misunderstanding and conflicts can be reduced (Koch, 2011; Lee, 2011).

In this respect, constant communication between both parties is key in allowing for continuous positive evaluations of the project by the partners and in increasing the chances that all parties' goals will be achieved (Plewa et al., 2013a).

5.2.2.3 Tie-categorizing and prestigious tie-seeking

Entrepreneurs also categorise network ties according to their usefulness for specific purposes. Tie-categorizing includes the mental mapping of the (potential) added value of distinct stakeholders. According to Batjargal (2010), tie-categorization practices enriches the social network, since individuals calculate how they would benefit from a relationship and to what extent they should invest time in building and nurturing such a relationship.

Closely related to this networking action, Vissa (2011) noted that some entrepreneurs categorize their ties according to their status and look for contacts that are high in prestige, evaluating what a relationship would mean for their own reputation and status. This networking action is conceptualized as "prestigious tie-seeking" (Stam, 2015) and is also considered a "networking competence" (Ritter & Gemünden, 2003). Incorporating prestigious ties into one's network helps entrepreneurs to modify their position towards a more central and powerful one beyond their personal embeddedness, and to generate sufficient and efficient network structures (Stam & Elfring, 2008).

5.2.2.4 Relational embedding, efforts to preserve existing ties and reliance on referrals

Conversely to tie-categorizing and prestigious tie-seeking networking practices that are more task-driven, Vissa (2012) found that entrepreneurs create friendships from work-related interactions and focus on contacts as people and not in terms of their roles. In his inductive study, he conceptualized the extent to which the ego seeks to combine social and business relations with existing contacts as "relational embedding".

The networking behaviour of entrepreneurs is not only about network growth; instead, entrepreneurs' networking actions also include the preservation of existing ties (Vissa, 2012).

Entrepreneurs that preserve their ties are also highly dependent on referrals when searching for exchange partners and are less successful at initiating new exchanges (Vissa, 2012). Nevertheless, this networking practice can be beneficial for entrepreneurial employees; for example, Obstfeld (2005) found that employees who were more oriented to tie formation between their existing network contacts were more likely to have greater involvement in organizational innovations. As such, some entrepreneurial educators might also be preserving their contacts and relying on their existing network when looking for resources for the realisation of their novelties in teaching.

5.2.2.5 Symbolic actions

Within the context of entrepreneurial employees, Zott and Huy (2007) found that the success of intrapreneurs in forming new ties with external resource holders is driven by the effectiveness of their symbolic actions. A symbol is something that stands for or suggests something else; it conveys socially-constructed meanings beyond its intrinsic content or obvious functional use (Pondy, Frost, Morgan, & Dandridge, 1983). Symbolic actions, such as mentioning working experience, personal commitment and the quality of stakeholder relationships – i.e. the contacts they know or work with – can help reinforce an intrapreneur's ability.

The question that remains is which networking actions can be identified among entrepreneurial educators. We thus investigate the networking behaviour of entrepreneurial educators and how those networking actions help them in the pursuit of opportunities for the creation of novelties in teaching with external actors.

5.3 **Methodology**

5.3.1 Study approach

Given the underexplored nature of the particular field of research and the exploratory nature of this study (Eisenhardt, 1989) a qualitative approach is utilized to answer our research questions. Specifically our study aims to "better understand the nature of the problem" (Saunders, Lewis & Thornhill, 2003, p.118) and to uncover occurrences and interconnectivity of emerging phenomena (Denzin & Lincoln, 2011). For the purposes of our study, we thus articulate two research questions to guide our investigation:

> *Q1 Which networking actions can we identify among entrepreneurial educators?*
>
> *Q2 How do those networking actions help them along the entrepreneurial process, mainly in the opportunity recognition, development and exploitation stages?*

To address these questions, we accordingly adopt a case-study approach (Eisenhardt, 1989). A case-study approach allows researchers to ask questions of how, why, and what. Furthermore, case studies permit replication logic, treating each case as an independent experiment to confirm or disconfirm the inferences drawn from other cases (Yin, 2003).

5.3.2 Data collection and analysis

The principal investigator was familiar with all universities where this research was conducted, which facilitated gaining access and understanding of the local context. The data collection stage for the European cases was executed in the spring of 2016 and for the Mexican cases in the summer of 2016 over a period of three months. The data collection process on both accounts consisted of (1) site visits, (2) semi-structured interviews with the

main entrepreneurial educators, (3) discussions with academic peers of the main entrepreneurial educators, (4) analysis of documents related to the teaching practice and (5) analysis of public documents and websites related to the entrepreneurial educator. The investigators' prior familiarity with the entrepreneurial educators and their practices was furthermore incorporated to make sense of the collected materials.

During the site visits, interviews were conducted with each of the identified entrepreneurial educators and with some of their peers. In addition, personal observations, and relevant documents from the teaching practices were collected during the site visit in order to triangulate our information.

Following the recommendations from Zeller (1991) and Miles et al. (2014, p.324) qualitative research accounts for the researchers' engagements over time with the participants in their surroundings, therefore field observations supported our understanding of the behaviour of entrepreneurial educators (main respondents) in their surroundings. *Table 15* shows a summary of the data sources of evidence used in this study.

Table 15: Data sources incorporated in the study

Data source	Use of data source in the study
Site visits	To make sense of the local context.
Semi-structured interviews with the main entrepreneurial educators	To capture the entrepreneurial educators' perceptions.
Discussions with academic peers of the entrepreneurial educators	To capture their perceptions in regards to the entrepreneurial behaviour of their peers.
Analysis of documents related to the teaching practice	To make sense of the innovative aspect of the teaching practice.
Analysis of public documents and websites	To understand and confirm findings with respect to the entrepreneurial educators' networking actions.

Data were collected in person; interviews ranged in length from 60 min to 90 min. Follow-on inquiries for clarification purposes were undertaken as needed. All interviews were semi-structured in nature, and followed a previously-designed interview protocol and topic list. *Table 16* shows examples of questions asked to address the networking behaviour of entrepreneurial educators as the main topic of inquiry. All interviews were taped and transcribed for analysis. In reporting the observations and results, we have used pseudonyms to anonymize the names of each of the entrepreneurial educators.

Table 16: Dimensions of networking behaviour

Example of questions posed to explore networking behaviour	Dimension of networking behaviour
Where do you meet the external actors that will participate in your courses? Are you present in digital social media? Do you attend conferences or public events? For which purposes?	Proximity mechanisms (Forret & Dougherty, 2001; Stam, 2015)
How do you choose the external actors that will participate in your courses?	Strategic intent and stakeholder awareness. (Mcvea & Freeman, 2005; Stam, 2015)
When you meet somebody or contact one of your connections, do you usually first consider how you might benefit from it or do you establish the relationship on the basis of personal affection?	Tie-categorisation and prestigious tie-seeking Behaviour (Batjargal, 2010; Stam, 2015; Vissa, 2012)
How do you acquire the external actors that will participate in your course? Are they in your close network?	Relational embedding (Vissa, 2012)
How do you maintain the relationship with the external actors that participate in your courses?	Efforts to preserve existing ties and reliance on referrals (Obstfeld, 2005; Vissa, 2012)
How do you think your entrepreneurial and industry experience has affected your teaching? How do you usually approach external actors to invite them to the courses?	Displaying symbolic actions (Zott & Huy, 2007)

Finally, a circular qualitative data analysis process (Miles et al., 2014) was used throughout the investigation: data collection, data reduction, and data display. After reducing and/or displaying the data, we compared it to the previously-created conceptual framework in order to draw inferences and conclusions. The final step in the analysis process revealed themes that were consistent across all eight case studies, and exposed extreme cases that depicted certain concepts from our framework.

5.3.3 Brief description of the cases

In terms of their profile, the interviewees possess a different level of academic and industrial or entrepreneurial experience. Each one of them has some form of industrial experience. Among the Mexican cases, only Dm and Gm have experience as business owners, and only Dm and Fm perform research besides teaching. On the other hand, entrepreneurial educators from Europe have industrial experience, experience as business owners and perform research besides teaching. *Table 17* presents the profile of the eight entrepreneurial educators selected for our study.

Table 17: Profile of entrepreneurial educators

	Individual cases	Nationality	Academic position	Performs research besides teaching	Experience in industry	Experience as business owner
European Cases	Ae	Dutch	Academic lecturer	√	√	√
	Be	German	Academic professor	√	√	√
	Ce	German	Academic professor	√	√	√
Mexican Cases	Dm	Mexican	Academic lecturer	√	√	√
	Em	Mexican	Academic lecturer	-	√	-
	Fm	Mexican	Academic director	√	√	-
	Gm	Mexican	Academic lecturer	-	√	√
	Hm	Brazilian	Academic lecturer	-	√	-

All the teaching practices had an innovative aspect, including teaching and research activities produced in the context of application, usability and transferability of knowledge to societal actors. Following Hasanefendic et al. (2016), as well as Hasanefendic et al. (2017) these aspects have been documented in the literature as novelties in teaching. In the same vein, external actors participate in the teaching practices at a lesser or higher degree where all of them have a stake in the content of the course as well as in the final evaluation of it. *Table 18* shows a summary of the cases including information about the teaching practices. For a more extended description of the cases, refer to Appendix C.

Table 18: Case details and context

Case[7]	Discipline	Programme	External involvement
Ae	Entrepreneurship	Minor in Entrepreneurship	Multidisciplinary student teams are challenged to develop a business case for real entrepreneurs and entrepreneurial ventures. Business entrepreneurs offer the challenges to the students and participate in the final evaluation of the course.
Be	Entrepreneurship Business ideation	International Marketing and Sales	Students develop new business ideas and present them to real entrepreneurs who will have a stake in the evaluation process. Entrepreneurs judge and grade the "Business Pitch" from the students in a final public event.
Ce	Marketing	International Business	Students perform research-based consulting projects for real companies from the region who pay money for the projects. Companies offer an official certificate for the students and have a stake in the evaluation of the students.
Dm	Business Incubation and family business	Entrepreneurship and Innovation	Individualised mentoring approach with entrepreneurs. Students need to have a company for graduation or a successor strategic plan for the family business.
Em	Social Entrepreneurship	Entrepreneurship and Innovation	Students work with companies from the Base of the Pyramid (BOP) to take them to the next level in innovation. Micro-entrepreneurs offer the challenges for the students and communicate with them throughout the course.
Fm	Business Incubation / Social entrepreneurship	Entrepreneurship and Innovation	Individualised mentoring approach with entrepreneurs. Students need to have a company for graduation. / Work with companies from the Base of the Pyramid (BOP).
Gm	Innovation	Entrepreneurship and Innovation	Real companies present micro-cases to students, which are related to a real problem that they are facing. External actors have a stake in the evaluation process.
Hm	Development of enterprises with high social impact	Entrepreneurship and Innovation	Individualised mentoring approach with entrepreneurs. Students need to develop a company that will impact the social sector. Real social entrepreneurs provide lectures and coaching for the students.

[7] European Cases: Ae, Be, Ce / Mexican Cases: Dm, Em, Fm, Gm, Hm

5.4 **Results and discussion**

The following section presents the results in regards to the networking actions conforming to the "networking behaviour" of the entrepreneurial educators. This serves as a basis for answering the question *how entrepreneurial educators network within the context of the university for the creation and execution of novel teaching practices in cooperation with external actors?* Furthermore, in *Section 5.4.2*, we relate the identified networking actions to the different stages of the entrepreneurial process.

5.4.1 The networking actions of entrepreneurial educators

Consensus exists regarding the importance of networking within and beyond the university. Among entrepreneurial educators, networking is considered as *"basic to develop their work"(Ae)* and *"a source of opportunities and resources to improve the core tasks of the university" (Fm)*. Networking furthermore allows entrepreneurial educators to organise their social capital, which plays a critical role in providing them access to social resources. This section presents the findings in respect to the networking actions conforming with the networking behaviour of the entrepreneurial educators in our study.

5.4.1.1 Proximity mechanisms.

Entrepreneurial educators organize their social accessibility through different *proximity mechanisms*. With respect to the use of *physical networking affordances*, we saw that European entrepreneurial educators (Ae, Be and Ce) most frequently attend public events outside the university (e.g. Academic conferences). On the Mexican side, only Fm and Hm claimed to make some time to attend entrepreneurial events in the city, consciously making time for network growth. Entrepreneurial educators Dm and Gm said they considered it more important to make face-to-face contact to external actors on a personal basis and for specific purposes, rather than for the sake of expanding their network. Finally, Em attends public events only if they take place within the university. The main issue in entrepreneurial educators attending public networking events is "time availability".

> *"I don't have much time to go to those "meet ups" but I try to go once or twice". Fm*
>
> *"The organisation has reduced the teaching load for us from 5 courses to 4 courses, 3 hours per week, it is in theory for doing networking. In theory they give time, but in practice it does not happen". Em*

Extreme cases with regards to the use of *physical networking affordances* are Be and Ce. Both entrepreneurial educators organize their own conference series, where they bring together academics and industry representatives in a network. For Be, this network is a core activity of his own business and for Ce, the conferences are organized around his main research topic.

Notably, all entrepreneurial educators declared that they prefer to target their networking efforts to achieve physical proximity with external actors. Exemplary cases in this respect are Ce and Dm, who directly invite or involve external actors in the creation and development of the teaching practice.

> *"… I have a talk with the manager of the company to define the project goals before we speak with the students…" Ce.*
>
> *"I just pick up the phone and I invite the external actors when I am creating the syllabus for the course, and I tell them: Would you like to take a look at the syllabus and have some input from your perspective?" Dm.*

Among our cases, we also recognize the organisation of *exposure routines* for their teaching practices (Stam, 2008). All entrepreneurial educators organize initial meetings and final presentations of projects where external actors are invited to the university or students go to the company to present their projects. Entrepreneurial educators use these events as a key opportunity to create visibility and buzz around the teaching practice, just as *Be* declares:

> *"We do a final presentation. The main purpose is to give the students a platform to present their ideas and increase their presentation skills, and on the other side as an opportunity to bring different actors from the entrepreneurship ecosystem together; so, basically as a network perspective". Be*

Additionally, the final presentation of projects is also considered a strategic networking action for entrepreneurial educators, to secure recurrent participation of external actors in their teaching practices. For instance, *Ae* would say,

> *"I invest time and energy in finishing the projects with the students and the external actors in the best possible way so they can be recurrent partners for the teaching practice". Ae*

With respect to the use of digital affordances, we saw a pronounced variation between the European entrepreneurial educators and the Mexican ones. European entrepreneurial educators actively utilize digital affordances to build and maintain their networks for professional purposes. In particular they use social media like LinkedIn, Research Gate and Facebook to gain interpersonal knowledge about their contacts and to reach out to them when necessary. For instance they would say:

> *"I am present in LinkedIn, Research Gate, Facebook, and Twitter …to stay in contact, be able to manage my address book… and be able to get up to-date information on what they are doing, when I need it". Be*

In addition, European cases use digital affordances for the *exposure routines* of their teaching practices, using specific sections of their websites to communicate their teaching approaches in cooperation with external actors. Finally, entrepreneurial educator *Be* also sends out e-newsletters to update his contacts about ongoing events and activities.

The Mexican entrepreneurial educators (Dm, Em, Fm, Gm, Hm), however, all indicated that, except for e-mail, they only used digital media in the personal sphere to keep in contact with personal friends and family members, as was expressed by *Dm:*

> *"I think that I can just use them as a hobby. My generation used to network face-to-face. We prefer to do that, and also by phone, but not using social media. I'm not a big fan of Facebook or Instagram…"Dm*

In summary, we found that entrepreneurial educators, in the same way as entrepreneurs, deploy proximity mechanisms to widen their range of contacts. However, when it comes to their realisation of their novel teaching practices in cooperation with external actors, entrepreneurial educators are intentional and strategic in the organisation of proximity, as opposed to networking in an *ad hoc* manner without a clear objective (Vissa, 2012), which represents a more or less conscious and strategic approach to the organisation of proximity and social accessibility (Stam, 2015). Hence, the networking actions of entrepreneurial educators towards achieving physical proximity with external actors are characterised by a *strategic intent* in the *intentional organisation of proximity with stakeholders* (e.g. External actors).

5.4.1.2 Strategic intent and stakeholder awareness

High levels of *strategic intent* and *stakeholder awareness* were evident in each of the cases. In line with Stam (2015) all entrepreneurial educators indicated that, in order to benefit from their network, in terms of being able to utilize the opportunities and resources present therein, they establish the relationship on the basis of predefined objectives on how it can be of benefit to themselves and to the stakeholders involved.

On the one hand, entrepreneurial educators were aware of which actors in their existing network could offer them specific types of support or resources for the realisation of their novel teaching practices. As an example, *Ae* recalls her experience:

> *"When I started this course the most important people I contacted for advice were my academic peers here at the university and my academic peers who are implementing a similar course in the Erasmus University". Ae*

On the other hand, entrepreneurial educators understand how stakeholders themselves can benefit from participating in a novel teaching practice. Two main stakeholders are identified: the students and the external actors.

Particularly in the case of entrepreneurial educators, contacts are approached with a predefined objective *(strategic intent)* of benefiting the students' learning experiences; either by choosing role models for the students or adequate industries that match the respective projects. In line with having the goal in mind, "caring for students" is an example of *stakeholder awareness*.

> *"I'm connecting with people that could be role models for the students". Fm*

> *"For me, it's important that the entrepreneur gives us the opportunity to work. So, if he or she gives us the opportunity to work, our students are going to have all the information on time". Em*

> *"If that person, for instance, is a girl that loves fashion - we brought an entrepreneur who started a fashion brand, so she was very happy". Gm*

As well as caring for the students, entrepreneurial educators are aware of the external actors as being among the main stakeholders. Nevertheless, entrepreneurial educators Ae, Be, Em and Fm expressed concern on the value delivered to the external actors that participate in their teaching practices. We see examples of this issue in the European cases as well as in the Mexican ones:

> *"One of the biggest challenges is getting the external actors to participate and to commit to the continuation of the course…" Em*

> *"…I am very much worried, whether they [the students] are providing good enough work. Because I really want that the partners involved also get value out of it, because they also invest time in it, … and in some cases I am very enthusiastic on the work that the students did, and other cases I am really disappointed (laughs)". Ae*

On the contrary, entrepreneurial educators Ce, Dm and Gm are confident about the value delivered to external actors. External actors benefit by *"…getting access to new knowledge and technologies and by being close to future employees…*" as expressed by Dm; or "*by getting new perspectives from the university and having potential future employees (the students) looking at their problems and challenges for a long period of time"* as expressed by Ce and by *"getting access to innovative concepts from the university without making high investments" Gm*.

A key networking strategy from Ce, Dm and Gm in order to meet the expectations of external actors is to engage them frequently in the development of the teaching practice. This networking practice is similar to what Stam (2015, p.190) denominates *"stakeholder alignment in opportunity development"*. For example, Ce meets the manager of the company to define project goals before meeting with the students. For her part, Dm invites external actors to help design the "syllabus" before the semester even starts, and Gm brings the company to the university or the students visit the company in order to get a common understanding of what the company expects from them. The company offers a "Questions and Answers" session with the students to further define the expected final product.

According to Plewa, et al (2013b) this constant communication would create a common understanding on how the project (teaching course) will be executed, which facilitates collective stakeholder learning of each other's expectations to establish value propositions for the achievement of mutually- beneficial outcomes as opposed to pursuing one's own self-interests.

5.4.1.3 Tie-categorisation and prestigious tie-seeking

Considerable variation in the use, motives and intentions exists amongst the entrepreneurial educators with respect to the extent to which they actively engage in both tie-categorisation and prestigious tie-seeking behaviour (Batjargal, 2010; Stam, 2015; Vissa, 2011). In the case of entrepreneurial educators, being selective and looking for prestigious ties are closely linked to the experience and status of the entrepreneurial educator. On the one hand, entrepreneurial educators willing to increase their own status and reputation will map the value of a relationship, and accordingly, they will decide whether or not to incorporate prestigious ties into their network (Ritter & Gemünden, 2003). An extreme case within these networking actions is entrepreneurial educator Be, who is a young scientist starting an academic career in the university. It is crucial for him to achieve centrality in the network, beyond his social embeddedness:

> *"…networking is good for your profile if you want to start a university career…. Also it is creating more awareness at the university as I am planning my academic career. It is important for me to be recognised within the university". Be*

Entrepreneurial educator Be proactively and strategically involves external actors holding prestigious positions into his teaching practices, such as inviting key actors in the entrepreneurial ecosystem of the region to be present at the final presentation in the university.

> *"At the final presentation night, we have people from the chambers of commerce, from the regional development agencies… it was the opportunity to bring different actors from the entrepreneurship ecosystem together". Be*

However, he does not do it by himself. He says he uses ties that occupy prestigious positions in the network in order to contact key actors in the entrepreneurial ecosystem.

> *"I got access to the judges for the final presentation through a colleague of mine who is very well positioned in the entrepreneurship ecosystem in the region, due to his membership in an entrepreneurial network". Be*

On the other hand, Ce holds a prestigious position in the academic realm. He is a director of his own research centre and an expert in his field and is regularly invited to conferences as a keynote speaker. His experience and status enables him to be very selective in his ties. His prestigious position in the academic realm allows him to approach key people in corporate leadership when inviting external actors to his teaching practices:

"Sometimes I am driving and if I pass in front of a company, I say: This company could be interesting for the students' projects" … I go to the company, and out of nowhere ask - may I please talk to the director of marketing or director of sales. Ce

Similar to Ce, Fm occupies a prestigious position in the academic realm; her role as an academic director allows her to be selective in her ties and to look for ties occupying prestigious positions in the network. She said for example: "*I use the intermediaries that I know are well connected, like educator Hm"*.

New-tie formation behaviour requires voluntary cooperation from the other actor (Vissa, 2011), therefore, entrepreneurial educators with high levels of experience and status will become preferred network exchange partners (Lamine, Mian, & Fayolle, 2014). For this reason Ce and Fm have the opportunity to speak to prestigious ties in other organizations to enrich their network, while Be needed to do it through referrals from well positioned ties.

5.4.1.4 Relational embedding, efforts to preserve existing ties and reliance on referrals

In order to acquire external actors, Mexican entrepreneurial educators seem to exploit digital and physical affordances to a lesser extent than their European counterparts. This suggests that the networking actions of the Mexican entrepreneurial educators are characterised more by the preservation of existing ties (Vissa, 2012) than by the initiation of new exchanges. According to Vissa (2012) entrepreneurs that preserve their ties exhibit higher levels of relational embedding, leading to a greater reliance on referrals when searching for exchange partners and decreased success at initiating new exchanges (Vissa, 2012).

In line with the findings from Vissa (2012), the networking behaviour of Mexican entrepreneurial educators is characterised by *relational embedding*. For example, Em said: *"…my network has been expanding thanks to my students… I try to keep in contact with them"*. In a similar fashion, Gm has access to external actors between friends and families*;* he said: *"… I have thousands of companies to bring on board for the courses… I see them everyday face-to-face"*.

Additionally, the entrepreneurial educators' networking behaviour is also characterised by *reliance on referrals*, such as Em and Dm who have been able to exploit their position in the network, using their students and *alumni* network to bring business owners to their course on family business, and social entrepreneurship. For example, Dm tells her students: *"…if your mother or father has a business, you can bring them on board"*.

Therefore, Mexican entrepreneurial educators might be less dependent on making themselves socially available in public events or through digital channels since they see their contacts every day on a personal basis.

Even though the Mexican entrepreneurial educators' networking behaviour might be characterised more by network maintenance actions, they also seem to be strategic and intentional when *relying on referrals*. For example, Fm seems to rely on *prestigious ties* for the acquisition of an external actor. In her team of educators, she involves ties occupying prestigious positions in other organisations for the purposes of spanning institutional boundaries. These networking actions enrich her network and her position in it beyond her embeddedness as an academic in the university, generating sufficient and efficient network structures (Stam & Elfring, 2008). Fm declared how she strategically maps the (potential) added value of distinct stakeholders according to specific purposes:

"I find people that are very important in different areas or situations… I use the intermediaries that I know are well connected like educator Hm… right now I'm thinking I need to improve the social entrepreneurship area more… this semester, I

take around six new teachers. Four are related to sustainability or social responsibility in the external world". Fm

5.4.1.5 Symbolic actions

These actions are effective when establishing initial contact, as it helps convince external actors to engage in meaningful and relevant exchange relationships (Zott & Huy, 2007). For example, Hm's experience working in the government plays a critical role when connecting with entrepreneurs in the area; Fm sees the need to mention her professional background when approaching external actors and Gm perceives that his entrepreneurial experience creates trust among the external actors. The following quotes from Hm, Fm and Gm support this reasoning:

> *"I think it helps that I'm a director in the government. People want to have good relationships with the government so I think it helps me to connect with other entrepreneurs in the area". Hm*
>
> *"I say to them: I know the whole process. I can support you… I know about marketing". Fm*
>
> *"The entrepreneurship is the key thing. They're more open because they know that if they have any problem with the student, you will understand them because you are an entrepreneur". Gm*

In summary, the networking behaviour of entrepreneurial educators for the execution of their teaching practices in cooperation with external actors is characterised by *strategic approaches to external actors with predefined objectives and stakeholder awareness* instead of *ad hoc* networking actions for the sake of expanding their network.

5.4.2 Networking style during the entrepreneurial process

The purpose of this section is to understand which role the different networking actions of the entrepreneurial educators play during the entrepreneurial process. The data collected and explored in this research leads to a discussion of the relevant networking actions characterising the networking behaviour of entrepreneurial educators at different stages of the entrepreneurial process, namely the opportunity recognition, development and exploitation stages.

5.4.2.1 Opportunity Recognition

The opportunity recognition stage is characterised by the development of an initial idea into a viable opportunity by matching attainable resources, with identified needs in the market or the context where they operate (Van der Veen & Wakkee, 2006). The successful evolution of the opportunity recognition process takes place through close interaction with the individual and the environment. On the one hand, the environment presents information to entrepreneurial educators that serve as a source of opportunities to create value. On the other hand, the entrepreneurial educators need to enact themselves to capture this information and translate it into an opportunity to create value. Accordingly, the following networking actions presented in *Table 19* characterise the networking behaviour of entrepreneurial educators in the opportunity recognition process.

5.4.2.1.1 Identification of needs among stakeholders

5.4.2.1.1.1 Proximity mechanisms:

According to Ce and Em, the origins of their teaching practice were connected to identified needs in their university and in the wider socio-economic context where the university is located:

> *"The original idea is from the program director (Fm) … we have, here in Mexico, a lot of micro-enterprises, more than 95% of all the companies… most of them have just secondary education, we thought that we had a big opportunity area in bringing them to the next level of innovation…". Em*

> *"… this teaching practice started in 1992. This was something that the university wanted to have; they wanted to be closer to the industry and also to provide better opportunities to students for their transition to the work place. Some other colleagues were doing something similar through co-supervision of thesis… I thought that something could be improved". Ce*

From their perspective, the economic and social profile of the country, as well as the willingness of the university to offer these practices, provided the perfect opportunity for them to make a difference in the students' learning experience and to get involved in a novel teaching practice where they could provide value to the students, the external actors and the university.

Therefore, being socially accessible through *proximity mechanisms* seems to be crucial for entrepreneurial educators to access information presented by their environment, namely the university and the external environment where the university is embedded. This information serves as a source of opportunities to create value.

In this context, the more proactive entrepreneurial educators are with respect to the organisation of their social accessibility, the more opportunities they will have to receive information about the needs in their environment.

5.4.2.1.1.2 Targeted proximity with stakeholders:

Networking within the university as well as direct approaches to external actors seem to be helpful in developing a common understanding of the needs and expectations of the main stakeholders of the novel teaching practice. Therefore, the more strategic the entrepreneurial educators are in generating proximity to their main stakeholders, the more precise the information they will get about their needs to translate an idea into an opportunity.

The qualitative interview data from Ae, Be and Fm presented in *Table 19* demonstrates the importance of networking both in- and outside the university in order to access information and resources as a source of entrepreneurial opportunities. Thus we propose:

Proposition 1: Proactivity, strategic intent and stakeholder awareness in the generation of social accessibility is positively associated with the identification of needs among stakeholders in the opportunity recognition stage.

Table 19: Networking actions in the opportunity recognition stage

Opportunity recognition		
Activity in the opportunity recognition stage	**Description of networking action**	**Example of evidence**
Identification of needs among stakeholders	**Proximity mechanisms (Use of physical and digital affordances):** Provides access to information presented by the environment	***Entrepreneurial educator Fm:*** *I try to be out there to see what is happening outside the university.* ***Entrepreneurial educator Be:*** *Having your contacts outside the university is important to have ideas about what relevant issues are and to be inspired about what is happening in practice and that you can use it afterwards in teaching and research.*
	Targeted design of proximity with stakeholders: Provides access to precise information on the needs of stakeholders	***Entrepreneurial educator Ae:*** *I think that networking within the university is important because you get to know more about the teaching, about the students, about their practices, about what happens within the university and how people experience all types of developments within the university. That is necessary to do your work well.*
	Direct approaches with stakeholders: Provides access to direct learning of the needs of stakeholders to create stakeholder awareness	***Entrepreneurial educator Ce:*** *I have a talk with the manager of the company to define the project goals before we speak with the students.* ***Entrepreneurial educator Dm:*** *I just pick up the phone and I invite the external actors when I am creating the syllabus for the course, and I tell them: Would you like to take a look at the syllabus and have some input from your perspective?*
The development of an initial idea into a viable opportunity	**Stakeholder awareness:** Assessing which actors in their existing network might be able to offer advice and resources required to address an identified need.	***Entrepreneurial educator Ae:*** *When I started this course the most important people I contacted for advice were my academics peers here at the university and my academic peers who are implementing a similar course in the Erasmus University.*

***Entrepreneurial educator Fm**: I didn't know much about how to work with these kind of companies (at the Base of the Pyramid). I met some people from Israel and, in fact, they are still my friends… they told me that we could make a kind of community with those entrepreneurs where they could learn and also they would be willing to support us in our teaching practices.*

5.4.2.1.2 Development of an initial idea into a viable opportunity

5.4.2.1.2.1 Stakeholder awareness:

For the development of an initial idea into a viable opportunity, all entrepreneurial educators in our cases assessed which actors in their existing networks could offer them specific types of support or resources to address an identified need (Stam, 2015). The networks of the entrepreneurial educators played a significant role in providing key resources, such as advice and experience, to develop an initial idea into a viable opportunity.

Entrepreneurial educators recognised and evaluated the opportunity as a good one because they perceived the required experience and knowledge to execute their teaching practices as attainable resources to address the opportunity. The quotes from Ae and Fm in *Table 19* serve as evidence of this reasoning with respect to "stakeholder awareness".

In sum, we claim that stakeholder awareness represents an important networking element in the process of developing an initial idea into a viable opportunity affecting the perceived resource attainability. Accordingly, we propose:

Proposition 2: Stakeholder awareness is positively associated with perceived resource attainability to develop an initial idea into a viable opportunity

5.4.2.2 Opportunity development and exploitation: Securing resources and gaining legitimacy

The development and exploitation of opportunities occur in close interaction between the entrepreneurial educator and his or her environment. Building a resource base is essential to the actual exploitation of an opportunity. Entrepreneurial educators must determine the resource needs to execute a teaching practice in cooperation with external actors and set about obtaining key resources, including legitimacy for their novel teaching practices. Institutions and networks in which entrepreneurial educators are embedded are of critical importance in securing access to key resources for opportunity development and exploitation (Aldrich & Zimmer, 1986). Accordingly, *Table 20* presents the different networking actions deployed by entrepreneurial educators for the different activities in the opportunity development and exploitation process.

5.4.2.2.1 Identification and acquisition of potential partners for their teaching practice

Acquiring an external actor for teaching practices is a key activity for entrepreneurial educators. In this respect, entrepreneurial educators engage in different social networking

practices, aimed at spanning the boundaries of the university, in order to gain access to external actors suitable for teaching practices. While some entrepreneurial educators exploit the use of proximity mechanisms to invite external actors to a greater extent, others rely on their existing networks and on referrals to acquire an external actor.

5.4.2.2.1.1 Proximity mechanisms:

All entrepreneurial educators in our cases claimed to enact themselves and strategically use *physical and/or digital affordances* (to a greater or lesser extent) to establish communication (via face-to-face or digital channels) and gain interpersonal knowledge of the counterpart, in order to decide if an external actor could be a potential partner for teaching practices, just as Ae recalls on how she exploits her *physical affordances:*

> *"I attend public events like conferences, primarily for networking purposes. For the same reason that I use social media, to be able to stay in contact and so that they can reach me if they have an opportunity that might be interesting for us to collaborate". Ae*

In this respect, Ce is an extreme case, who uses *cold-calling approaches* directly inviting external actors to participate in the teaching practices.

> *"I go to the company, and out of nowhere ask - may I please talk to the director of marketing or director of sales and then comes a meeting in my centre… ". Ce*

Regardless of the location, proximity mechanisms enable the entrepreneurial educators to open up possibilities for expanding their network, as declared by Ae:

> *"… during events I speak with people, and then comes the exchanging of cards. Then I think: What can I do with these people? So we start having a conversation, or otherwise is a sleeping mode connection until I think: Ok, I need someone, who do I know?" Ae*

Therefore, we propose:

Proposition 3a: Proximity mechanisms are positively related to the identification of potential partners for teaching practices.

Table 20: Networking mechanisms in the opportunity development and exploitation stages

Opportunity development and exploitation		
Activity in the opportunity development and exploitation stages	**Description of networking action**	**Example of evidence**
Identification of potential providers of resources	**Proximity mechanisms (Use of physical and digital affordances):** Establishment of communication and interpersonal knowledge of the counterpart to decide whether or not an external actor can be a potential partner for teaching practices.	***Entrepreneurial educator Ae:*** *When I am looking for the external partners for my course, I go to my linkedin account and search among my contacts, look through their profiles and I see who can be most appropriate for the course* ***Entrepreneurial educator Be:*** *I attend to public events like conferences, primarily for networking purposes. For the same reason I use social media, to be able to stay in contact and so that people can reach me if they have an opportunity where it might be interesting for us to collaborate.*
Acquisition of an external actor to participate in the UBC-based teaching practice	**Direct cold-calling approaches:** Direct invitation of the external actor to participate in the teaching practice	***Entrepreneurial educator Ce:*** *I go to the company, and out of nowhere ask - may I please talk to the director of marketing or director of sale?. Most of the times, they receive me and I start the conversation introducing our projects with students. My conversations, most of the time end by them saying: sure, let's have a coffee or a talk to discuss it". …and then comes a meeting in my centre... And then we are there signing the contract.*
	Relational embedding: Approach to the close network of friends, family and students to acquire an external actor to participate in a teaching practice.	***Entrepreneurial educator Gm:*** *I have access between friends and family; I have thousands of companies to bring on board for the courses.* ***Entrepreneurial educator Em:*** *My network has been expanding thanks to my students.*
	Reliance on referrals: Reliance on the network of others to acquire an external actor for the teaching practice	***Entrepreneurial educator Dm:*** *I tell my students: If your mother or father has a business, you can bring them on board.* ***Entrepreneurial educator Em:*** *Fm, the director of the programme just hired a*

		person, a month ago maybe, and she's helping us to get these enterprises from the social sector.
	Reliance on referrals with prestigious tie-seeking: Networking with ties occupying prestigious positions in other organisations that span institutional boundaries in order to have access to the most adequate external actor for the teaching practice	***Entrepreneurial educator Fm:*** *I find people that are very important in different areas or situations… I use the intermediaries that I know that are connected like educator Hm.*
		Entrepreneurial educator Be: *I got access to the judges for the final presentation through a colleague of mine who is very well positioned in the entrepreneurship ecosystem in the region, due to his membership in an entrepreneurial network*
	Efforts to preserve existing ties: Practices designed to secure recurrent participation of the external actors.	***Entrepreneurial educator Ae****: I invest time and energy in finishing the projects with the students and the external actors in the best possible way so they can be recurrent partners for the teaching practice".*
		Entrepreneurial educator Fm: *My Israeli friends, showed me that we can find three kinds of entrepreneurs, one that is very technical… another one is the seller entrepreneur… and the third one is the marketing entrepreneur. That's why we decided to make interviews at the beginning with the entrepreneurs we work with, so we can identify them and classify them to match them with the students' personality.*
Acquiring knowledge, advice and expertise for opportunity development and exploitation	**Networking with academic peers and friends:** Practices designed to get advice and knowledge on how to execute the actual teaching practice	***Entrepreneurial educator Hm****: It's the first time I'm teaching in university. Before, I got a lot of experience on workshops, events, and other kind of education. For me it's very hard because I feel like once these students enter the campus, they change their mind-set… I gathered with the other teachers to play games and decide what would work in our classes… We decide how many experts, or people we know that could support our classes.*
	Efforts to preserve existing ties: Practices designed to maintain	***Entrepreneurial educator Ae****: I am not afraid of contacting people that I meet 10 years ago and that I haven't seen in the*

	reciprocity in existing relationships to ensure they are approachable and exploitable when necessary	*meantime and I said: is it really long time ago? (laughs)... Through linkedin we are updated of what each other does.*
Gaining legitimacy. The generation of social acceptance and legitimacy for their teaching practice	**Strategic intent and Stakeholder awareness:** Legitimises their actions in front of the students, caring for them as the first stakeholder of the teaching practice	***Entrepreneurial educator Fm:*** *I'm connecting with people that could be role models for the students.* ***Entrepreneurial educator Em:*** *For me, it's important that the entrepreneur gives us the opportunity to work. So, if he or she gives us the opportunity to work, our students are going to have all the information on time. I know if it will work or not based on my experience working with these companies. The selection of the companies is very intuitive.* ***Entrepreneurial educator Gm:*** *If that person, for instance, is a girl that loves fashion. We brought an entrepreneur who started a fashion brand, so she was very happy.*
	Strategic intent and Stakeholder awareness: Engagement of external actors in the opportunity development stage	***Entrepreneurial educator Ce:*** *I meet with the manager of the company to define the project goals before meeting with the students.* ***Entrepreneurial educator Gm:*** *The company visits the university or the students visit the company in order to get a common understanding of what the company expects from them. The company offers a "Questions and Answers" (Q&A) session with the students to further define the expected final product.*
	Strategic exposure of the teaching practice: Creates visibility and buzz around the teaching practice	***Entrepreneurial educator Be:*** *At the final presentation night, we have people from the chambers of commerce, from the regional development agencies… it was the opportunity to bring different actors from the entrepreneurship ecosystem together.* ***Entrepreneurial educator Ce:*** *Information about the teaching practice is displayed in the website of my research centre. The purpose is to create awareness that an academic course is*

	supported by external actors… it also displays information on the results from past projects, which communicates external actors what we can do for them.
Use of symbolic actions (mentioning their professional experience): Legitimises their actions in front of external actors.	***Entrepreneurial educator Fm:*** *I approach them and I tell them: I know the whole process. I can support you with the process. I know about marketing. We can make some surveys to see if the product could have an improvement or not.*
	Entrepreneurial educator Hm: *I think it helps that I'm a director in the government, and people want to have good relationships with the government so I think it helps me to connect with other entrepreneurs in the area.*
	Entrepreneurial educator Fm: *For the entrepreneurs at the base of the pyramid it was very difficult. That's why I saw that I need to be in some meetings and they believed me.*
Experience in the opposite environment as a proximity mechanism: Creates cognitive and relational proximity with external actors to generate legitimacy in front of external actors and build trust among them.	***Entrepreneurial educator Ce:*** *My staff of researchers and I are always in the meetings with the manager of the company. It is important that they see they are in good hands besides participating in the learning experience of the students… it makes a big difference because we are providing research-based consulting for them.*
	Entrepreneurial educator Gm: *The entrepreneurship is the key thing. They're more open. Why? Because they know if they have any problem with the student, you will understand them because you are an entrepreneur.*

5.4.2.2.1.2 Relational embedding, strategic reliance on referrals and efforts to preserve existing ties:

Table 20 shows that besides the deployment of *proximity mechanisms* to get in contact with external actors and build a network for teaching practices, *relational embedding*, strategic *reliance on referrals* and *efforts to preserve existing ties* are networking actions characterising the networking behaviour of entrepreneurial educators in the acquisition of an external actor for their teaching practices.

Under the rationale from Vissa (2012), entrepreneurial educators that rely on their existing

network and on referrals to acquire external actors are more inclined to preserve existing ties in order to ensure that they are approachable and exploitable when necessary. Thus, we propose:

Proposition 3b: Efforts to preserve existing ties, are positively related to relational embedding and strategic reliance on referrals networking actions for the acquisition of external actors.

Proposition 3c: Relational embedding, strategic reliance on referrals and prestigious tie-seeking are positively related to the identification and acquisition of potential partners for teaching practices.

In summary, the identification and acquisition of an external actor in the entrepreneurial process seems to be strategic. Entrepreneurial educators rely on various methods to acquire potential partners, be it their existing networks or direct call-calling approaches.

5.4.2.2.2 Acquiring knowledge, advice and expertise for opportunity development and exploitation

5.4.2.2.2.1 Networking with academic peers and friends:

Other key resources in the opportunity development and exploitation stage are the experience and knowledge to execute the actual teaching practice. All entrepreneurial educators in our research used their close network of friends, family and academic peers to attain these kinds of intangible resources.

For example, Fm made use of her network to get advice and knowledge on how to execute a teaching practice in the social entrepreneurship area. The information she got from her contacts helped her to make decisions on how best to implement the teaching practice and how best to work with the companies, just as she recalls in the following quote:

> *… my Israeli friends show me that we can find three kinds of entrepreneurs, one that is very technical… another one is the seller entrepreneur… and the third one is the marketing entrepreneur. That's why we decided to make interviews at the beginning with the entrepreneurs we work with, so we can identify them and classify them to match them with the students' personality… Fm*

Interestingly, Hm, who was the educator recruited as a specialist in the social entrepreneurship area at the ministry of innovation, also saw the need to network with her academic peers in order to get the academic experience and information that she lacks for the execution of the teaching practice, as she expresses:

> *…It's the first time I'm teaching in university. Before, I got a lot of experience on workshops, events, other kinds of education. For me, it's very hard because I feel like once these students enter the campus, they change their mind-set… I gathered with the other teachers to play games and decide what would work in our classes… We decide how many experts, or people we know that could support our classes. Hm*

Accordingly, we propose:

Proposition 4a: The entrepreneurial educators' social network of friends and academic peers will predict access to knowledge, advice and expertise for opportunity development and exploitation.

Proposition 4b: Efforts to preserve existing ties are positively related to having access to knowledge, advice and expertise among academic peers and friends for opportunity development and exploitation.

5.4.2.2.3 Gaining legitimacy

5.4.2.2.3.1 Strategic intent and stakeholder awareness:

A key resource for entrepreneurial educators is the generation of legitimacy for a teaching practice that deviates from the traditional mode of lecturing. If the innovation in teaching does not abide with the rules and norms of the higher education institution, or does not provide any value to other stakeholders involved, such as external actors, the teaching practice lacks legitimacy (Suchman, 1995).

To generate legitimacy, entrepreneurial educators engage in networking practices characterized by clear *strategic intent* and *stakeholder awareness*. Entrepreneurial educators demonstrate strategic intent and stakeholder awareness towards the students by looking for external actors that can be good for the learning experience of the student, while their strategic intent and stakeholder awareness towards the external actors is demonstrated by engaging them in the opportunity development stage.

Table 20 shows how *strategic intent* and *stakeholder awareness* are important to legitimize teaching practices in front of students and external actors. Clear *strategic intents* and *stakeholder awareness* are key networking mechanisms for entrepreneurial educators, to connect their teaching practices to existing social structures. Only if these teaching practices are beneficial to all parties involved, will trust be developed, thus acting as an antecedent to social capital (Kotter, 1999; Thompson, 2005; Wolff & Moser, 2010). At the end of the day, legitimacy is a key resource for the successful advancement of the entrepreneurial process and the ultimate value creation; *"... Value that is created for all actors involved"*. Thus, we propose:

Proposition 5a: Strategic intent and stakeholder awareness are positively related to the generation of legitimacy of innovative teaching practices.

5.4.2.2.3.2 Strategic exposure of teaching practices:

All entrepreneurial educators in our cases use the organisation of final presentations of projects from the UBC-based teaching practices as a key means in creating visibility and buzz around the teaching practice, thus helping them to generate social influence for the generation of legitimacy of their teaching practice (Aldrich & Fiol, 1994; Lounsbury & Glynn, 2001; Zimmerman & Zeitz, 2002).

The strategic use of physical and digital affordances supports entrepreneurial educators in communicating the value proposition to different stakeholders, in order to make the teaching practice more comprehensive and gain what Suchman (1995) defines as cognitive legitimacy. Accordingly, we propose:

Proposition 5b: The use of exposure routines of the teaching practice is positively related to the generation of legitimacy of innovative teaching practices

5.4.2.2.3.3 Use of symbolic actions: Experience in the non-academic environment as a proximity mechanism

When looking closely to the way in which experience plays a role in the opportunity development process, we saw that each of the eight entrepreneurial educators had some sort of entrepreneurial and industrial experience, and used this experience to back up the legitimacy of the students and their teaching course in front of external actors. For example, Ce saw the need to be present in the meetings with the external actors in order to cultivate trust among them.

> *"My staff of researchers and I are always in the meetings with the manager of the company. It is important that they see they are in good hands besides participating in the learning experience of the students… it makes a big difference because we are providing research-based consulting for them". Ce*

When we asked general and open-ended questions about the execution of teaching practices, we received narratives from the entrepreneurial educators where they made connections between themselves and their teaching practices. We found that the entrepreneurial and industrial experience of our interviewees helped them to develop teaching practices in cooperation with external actors because it created a form of cognitive and relational proximity to them. The following quotes from our interviewees serve as an example of this relationship between entrepreneurial and industrial experience and the development of the opportunity:

> *"The entrepreneurship is the key thing. They're more open. Why? Because they know if they have any problem with the student, you will understand them because you are an entrepreneur." Gm*

> *"I approach them and I tell them: I know the whole process. I can support you with the process. I know about marketing. We can make some surveys to see if the product could have an improvement or not". Fm*

Having experience in the non-academic environment (entrepreneurial and industrial experience) acts as a proximity mechanism that bridges the cognitive and relational barriers with external actors in the opportunity development stage.

Literature on Institutional Entrepreneurship has also made a strong case that supports our findings. It claims that individuals who are embedded in multiple fields (e.g. Academia and industry) have consciousness of multiple institutional logics, which Thornton (2004) defined as "assumptions and values, usually implicit, about how to interpret organisational reality, what constitutes appropriate behaviour, and how to succeed". As these individuals understand the norms of both fields, they have a greater understanding of their counterparts' environment thus creating cognitive proximity. Cognitive proximity creates greater stakeholder awareness to foster the development of cooperative relations for the achievement of mutually beneficial outcomes.

This is an interesting finding because it adds new insights to the previous studies of traditional entrepreneurship, UBC and social entrepreneurial networking. In studies of entrepreneurship we find evidence that the experience of the entrepreneur serves as a source of opportunities (Shane, 2000). However, in our cases it is also an affordance to network with external actors in the opportunity development and exploitation stage. Thus, we propose:

Proposition 5c: Entrepreneurial educators' prior industrial and entrepreneurial experience is positively related to the generation of legitimacy for their teaching practices.

Proposition 5d: Entrepreneurial educators who execute and develop a teaching practice in cooperation with external actors are more likely to have prior industrial and entrepreneurial experience.

Figure 6 depicts the overall framework of the role of the networking behaviour of entrepreneurial educators during the entrepreneurial process, summarizing the networking actions characterising their networking behaviour at each one of the stages of the entrepreneurial process.

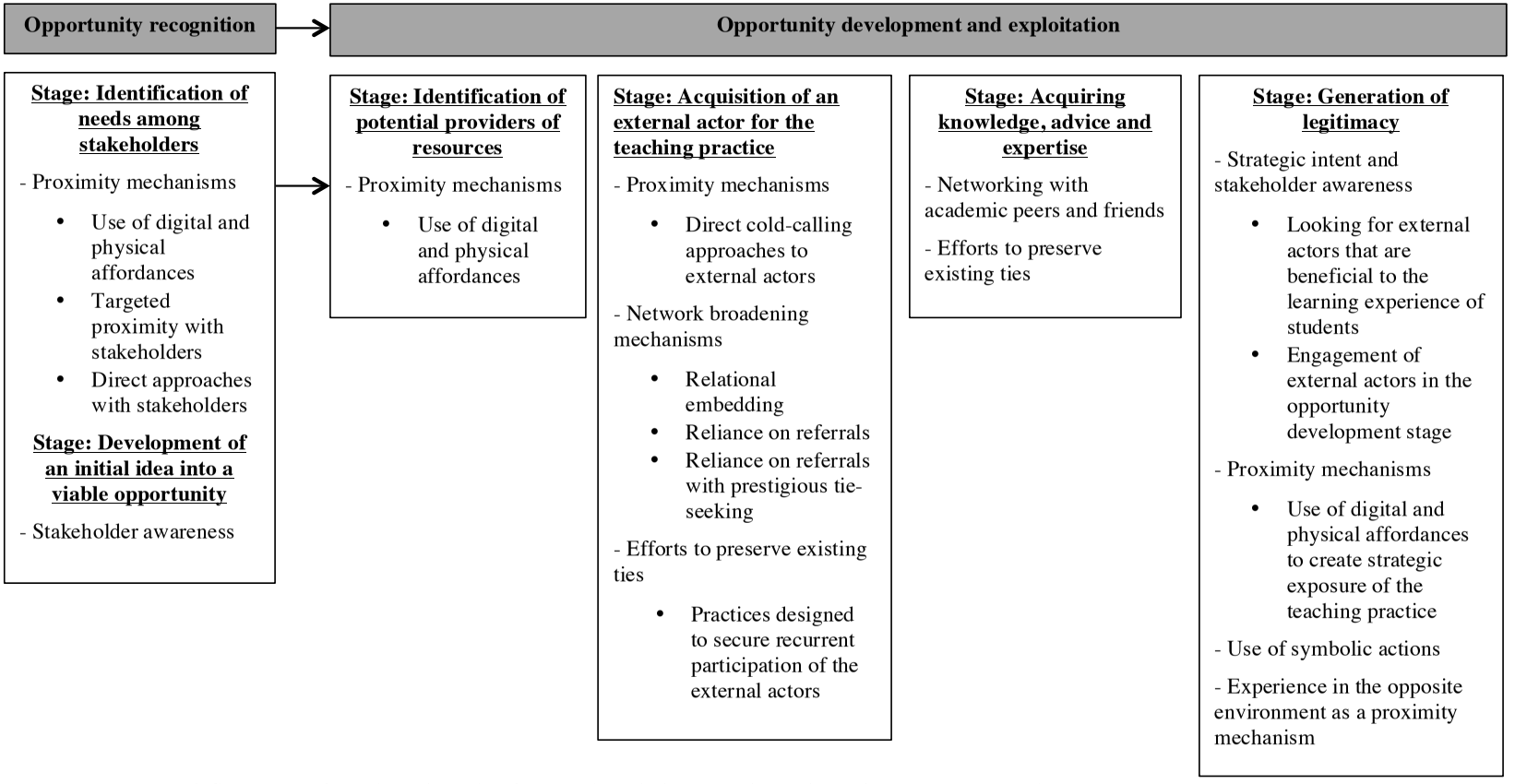


Figure 6. Summary of results: The role of networking behaviour throughout the entrepreneurial process

5.5 **Conclusions, limitations and further research**

To successfully execute teaching practices in cooperation with external actors and further intensify cooperative activities with them, academics need to meet the specific benefit expectations of all the stakeholders involved. Therefore, during the opportunity recognition stage, successful entrepreneurial educators exhibit a *strong strategic intent* in the creation of *targeted proximity with stakeholders* to better understand their needs. These networking actions will better shape the initial idea into an opportunity that can be further developed. *Efforts to preserve existing ties with their friends and academic peers* are also a characteristic of the networking behaviour of successful entrepreneurial educators, who reach out for advice on how best to proceed with the development and exploitation of an initial idea.

During the opportunity development and exploitation stages, entrepreneurial educators vary in their networking actions to acquire an actual external actor to participate in their teaching practices. While European entrepreneurial educators exploit to a greater extent their *physical and digital affordances* for the acquisition of an external actor, the networking behaviour of Mexican entrepreneurial educators is characterised by *relational embedding* and *reliance on referrals* using their close and strong network of friends, family and *alumni* as a key path to acquire external actors for their teaching practices.

The generation of legitimacy, as a key resource for their innovations in teaching, is achieved through networking actions with high *strategic intent* and *strong stakeholder awareness*. All entrepreneurial educators invest time and resources in developing a moral proposition of the teaching practice on behalf of both parties involved (students and external actors). In particular, they realise that gaining legitimacy among external actors requires substantial interaction with them to develop a common understanding of the opportunity. For example, entrepreneurial educators define the goals of the teaching practice collectively with the external actors during the opportunity development stage, while still focusing on the main stakeholder of the teaching practice - the student.

With the importance of having a *"strategic intent"* as well as *"stakeholder awareness"*, the networking behaviour of entrepreneurial educators is portrayed as a goal-oriented behaviour to the "creation of something of value" to a given community, such as students and external actors; which is the link to the creation of social value.

The entrepreneurial and industrial experience of entrepreneurial educators is essential in the generation of legitimacy. In this respect we found a particular theme emerging from our results - the consideration of "experience in the non-academic environment" (entrepreneurial and industrial experience) as a proximity mechanism and as an affordance to network with external actors. Through *physical or digital affordances,* entrepreneurial educators create proximity with external actors in time and space, which helps them to overcome the well-documented structural barrier of "lack of awareness from the existence of academics and business people in UBC" (e.g. Davey et al., 2011b; Galan-Muros, 2016). However, through their experience in the non-academic environment, entrepreneurial educators create cognitive and relational proximity with external actors. On the one hand it helps them to achieve a common understanding of the opportunity (cognitive proximity). On the other hand, it generates trust among the external actors as it shows what they can do for them (relational proximity). Therefore, through their experience in the non-academic environment as a proximity mechanism, entrepreneurial educators overcome the well-documented barrier for

UBC entitled “cultural differences” (Davey et al., 2011b; Galan-Muros, 2016; Plewa, 2009) between business and universities.

5.5.1 Theoretical implications

With our findings we contribute to the literature on UBC by introducing the concept of “Affordances” in the UBC literature, arguing that “experience in the non-academic environment” is an “Affordance” for entrepreneurial educators to network with business since it bridges the cognitive and relational proximity with them. With this finding, we go one step further from previous research on the role of experience in partnerships and alliances in UBC (e.g. Korff, 2014) by explaining how experience will interact with the networking behaviour of entrepreneurial educators.

Alongside this contribution, we add to the debate on UBC with respect to the drivers for successful cooperation. Prior research on UBC has mainly focused on research-based cooperation where shared goals, communication and trust are essential for collaboration success (Barnes et al., 2002; Korff, 2014; Plewa & Quester, 2008). In our research, we found that these factors are also applicable in education-based UBC since academics, as educators, need to convey their professional credibility in front of external actors, cultivate trust among them and gain a common understanding of how they can also benefit from their participation in teaching practices. Additionally, we have shown that shared goals, communication and trust do not happen out of the blue, but are essential drivers fostered and nurtured by the proactive networking behaviour of the entrepreneurial educator. We therefore have addressed the call from Perkmann et al. (2013) on the need to further research education-driven academic engagement with external actors.

With respect to the literature on social networks and entrepreneurship, most of the research that has been conducted in this field focuses on the role of networks facilitating and constraining opportunities, behaviours, and cognitions of social actors (Tindall & Wellman, 2001, p.256). These studies offer the big static picture of networks. However, we have approached this line of research by focusing on the “networking” behaviour of individuals. Our findings add to the existing literature on networking behaviour of entrepreneurs, which portrays networking as an organising process that plays a key role in the opportunity development stage (e.g. Stam, 2015; Vissa, 2011, 2012). Vissa (2012) has inductively conceptualized the networking actions of entrepreneurs; Stam (2015) has empirically clustered entrepreneurs according to the intensity of their networking practices. We hereby extend this line of research by showing how the networking behaviour of entrepreneurial educators is executed at different stages of the entrepreneurial process.

5.5.2 Managerial implications

Besides the theoretical contributions, our study provides some practical implications. Firstly, for entrepreneurial educators with less proactive networking behaviour in terms of creating proximity with external actors, networking within the university is crucial, since it will be their affordance to reach out to colleagues in bridging positions, who can provide access to external actors. In the same vein, universities should encourage interaction within their academic community in order to propitiate encounters among peers. With these practices, universities can embrace entrepreneurship as a collective act within the university.

Secondly, entrepreneurial educators care for students as their main stakeholder when engaging in UBC within the context of teaching. This statement reinforces previous recommendations on UBC studies (Baaken, Rossano, Von Hagen, Davey, & Meerman, 2016) and academic entrepreneurship literature (De Silva, 2012), stating that cooperating with business partners for teaching purposes could be considered a process whereby entrepreneurial educators start or intensify their entrepreneurial engagements and develop certain entrepreneurial skills that help to establish a network of contacts with businesses. Hence, instead of pushing them into a new career path for research commercialisation, these teaching practices could be a good starting point for those universities and regions with a less developed ecosystem for UBC in general.

Finally, entrepreneurial educators should be aware of the important role of generating legitimacy when willing to create novelties in teaching. Entrepreneurial educators must be aware that acting at the interface of academia and business involves several actors with partly different views and objectives; therefore, involving key stakeholders in the planning and development of such teaching practices (opportunity development) will help them to comprehend and meet the specific benefit expectations of all the actors involved and hence secure stakeholder commitment to for their novelties in teaching.

5.5.3 Limitations and further research

While the study provides valuable insights, several limitations should be considered. Firstly, the generalizability of our findings remains limited to the context in which the pursuit of opportunities takes place. In our research, we focus on a particular group of opportunities within the context of teaching practices. Within this context our interviewees have a specific role that they need to fulfil; they are educators and belong to the highly institutionalized environment of higher education. Their role defines their strategic intentions and hence limits the amount of opportunities they could exploit. In order to be effective, they need to narrow their opportunities to what is fitting to their role. This is a limitation when we want to generalize these findings among the general literature on entrepreneurial behaviour. Limiting one's opportunities to pre-established intentions does not allow entrepreneurial educators to account for serendipity. In this case, entrepreneurial educators should and must limit their choices for this context but it does not apply to all entrepreneurs who move in a wider context.

Entrepreneurs are actors embedded in social relations experiencing a number of casual encounters with other social actors. Therefore, by opening up the possibilities for encounters without limitation to ones intentions, entrepreneurs might discover opportunities that they were not looking for in the first place. Further studies should reflect on this paradox between networking as a planned behaviour and serendipity as a key part in the entrepreneurial and innovation process (Dew, 2009). If entrepreneurial educators are networking with pre-established objectives and strategic intentions, where are they going to find new ideas for innovations within the academy?

Secondly, our eight case studies across countries created a solid foundation for our research, yet should be broadened in the future to seek insights from entrepreneurial educators executing these teaching practices in other countries and contexts. Thirdly, while the interviews conducted among entrepreneurial educators allowed for a comprehensive analysis on their networking practices, it does not enable us to gain further insights on the real impact

of such networking practices on the learning experience for students. This perception is important in order to acknowledge the research line in higher education. Hence, future research may focus on the perception of students that participated in such teaching practices. Finally, while our case study approach allowed us to comprehend "how" networking behaviour plays out throughout the entrepreneurial process, further studies would benefit from a quantitative perspective to confirm on a larger scale the role of entrepreneurial educators' networking behaviour on UBC-based teaching as a whole.

Chapter 6 The relevance of problem-based learning for policy development in University-Business Cooperation[8]

Abstract

Most prior research on academic entrepreneurship focuses on the interplay between university research and technology transfer activities in the form of joint research, spinoffs, licensing and patenting. Yet there still remain questions with respect to the role of academic entrepreneurship in education and learning. Lifelong learning has been developing into one of the top priorities for many higher education institutions, with a greater emphasis on developing transversal skills, including entrepreneurship. One approach to developing transversal skills through education, which is adopted increasingly, is through problem-based learning (PBL). PBL shifts the focus from teacher-driven education to student-centred learning involving active participation of learners. By taking the students' perspective, this paper presents the effects of PBL in the context of university-business cooperation (UBC), on the development of students' transversal skills. According to our findings UBC-based PBL has an effect on the interpersonal skills of students, such as teamwork and communication, and turns out to be a promising approach with regard to entrepreneurship education and paving the way for long-term and more intense UBC activities.

[8] *Rossano, S., Meerman, A., Kesting, T., & Baaken, T. (2016). The Relevance of Problem-based Learning for Policy Development in University-Business Cooperation. European Journal of Education, 51(1), 40-55.*

6.1 Introduction

The literature defines academic entrepreneurship in many ways. Some authors regard it as a concept associated with commercialisation and new business ventures (Etzkowitz et al., 2001; Shane & Stuart, 2002). For others, it includes the engagement of academics in entrepreneurial activities with businesses so as to introduce novelties in teaching (Etzkowitz & Leydesdorff, 2000; Laredo, 2007). This article follows the latter understanding. The engagement of academics in entrepreneurial activities with businesses has the potential to create learning environments that are conducive to entrepreneurial behaviours (Gibb & Hannon, 2006).

A promising approach to entrepreneurship education is the implementation of problem-based learning (PBL) (Hamburg, 2015; Hoidn & Kärkkäinen, 2014), which shifts the focus from teacher-driven education to student-centred learning (Crosier, Purser, & Smidt, 2007). While this approach has been successfully applied worldwide (Hoidn & Kärkkäinen, 2014), PBL can provide further educational value when combined with university-business cooperation (UBC). Real-life business activities must regularly deal with various challenges and problems, and thus involve great uncertainty and risk. Hence, the integration of real-life business problems in academic education configures a context in which creativity and entrepreneurial behaviour can be nurtured and developed.

Many studies highlight the benefits for higher education institutions (HEIs) of cooperating with businesses to enrich education (Forsyth et al., 2009; Siegel et al., 2007), curriculum design and delivery (Plewa et al., 2015) and students' employability skills (Baaken et al., 2015; Kiel, 2014). Yet there is still need for further research to address the effects of such cooperation on education and learning from the students' perspective. To contribute to closing this gap, this article analyses the effect of PBL in the course of UBC projects on the students' skills, and more particularly those transversal skills that are considered to be important for entrepreneurs. We developed and conducted an online survey, addressing students who participated in UBC-based PBL projects at one of the largest universities of applied sciences in Germany. We analysed a data set of 150 responses. Our focus lay on analysing the perceived motivation and benefits related to the development of skills. We provide insights into the aspects that make such projects beneficial for students and help to provide a better understanding of UBC-based PBL projects in the light of entrepreneurship education. Additionally, the results help to the results help to identify further future research directions, as well as the implications for academics and their role in conducting UBC-based PBL projects.

6.2 Academic entrepreneurship and education

6.2.1 The impacts of academic entrepreneurship in education

Following Audretsch (2009), today's economy can be characterised as an entrepreneurial environment where entrepreneurship is the driving force behind economic growth and performance. Thus, an institutional context, which is conducive to entrepreneurial activity, may facilitate such entrepreneurial-driven economic growth. In this respect, a more entrepreneurial approach with respect to the academic education provided by universities involves the engagement of academics and students with businesses in a more enterprising and innovative manner (Davey, 2015, p.12). This approach not only emphasises the acquisition of knowledge, but also the development of competencies with respect to specific

skills and entrepreneurial attitudes (Audretsch, 2002). However, this entrepreneurial focus on academic education imposes specific challenges on actors within both universities and businesses. Academics intending to act as promoters of UBC will have to extend their orientation beyond teaching and research. They will need to be aware of and deal with the "cultural differences" between academia and businesses (Plewa & Quester, 2008). They will also need to balance their regular academic duties and their entrepreneurial engagements with businesses, since both activities demand great efforts and time commitments (Wright et al., 2004). Not managing this challenge may result in academics' underperformance in teaching and/or research (Bercovitz & Feldman, 2008). In this respect, there are fears that the quality of teaching may be negatively affected by the entrepreneurial engagements of academics due to resource conflicts (De Silva, 2012).

From a positive standpoint, De Silva (2012) found that additional benefits could arise as a result of interactions among different academic entrepreneurship activities. The author calls these "synergistic effects" (p. 54). The literature on systems theory defines them as *"the whole is better than the sum of its parts"* (Von Bertalanffy, 1972, p.407). Academics who are experienced in collaborating with businesses are deemed to have a positive influence on education since UBC contributes to producing graduates who are suited for careers in industry (Baldini et al., 2006). This symbiotic relationship was also highlighted by Etzkowitz (1998). He argued that academics benefited from additional income, experience, knowledge, and contacts developed through academic entrepreneurship to improve traditional academic tasks (e.g. teaching and research). Louis et al. (2001) and Siegel et al. (2004) found that academic entrepreneurs were more productive in terms of teaching and research than academics with no entrepreneurial engagements. To sum up, such arguments with respect to the impact of academic entrepreneurship on education, imply further research from the perspective of the students.

This need is emphasised in the light of the "ET 2020 strategic framework" in which the Council of the European Union (2012) addressed the development of transversal skills, advocating the inclusion of entrepreneurship and innovation at all levels of education and training where *"…the acquisition of transversal competences by all citizens should be promoted and the functioning of the knowledge triangle (education-research-innovation) should be ensured"* (European Commission, 2012, p.4).

6.2.2 Skills Development, Entrepreneurship Education and Problem-Based Learning (PBL)

With the emphasis on skills development for lifelong learning (European Commission, 2011), the role of universities is perceived as going beyond preparing students to meet the demands of the labour market (Pavlin, 2014). According to Teichler (2013, p.422) graduates additionally need to be trained to deal with unexpected tasks. Hence, HEIs educational functions should relate to the students' abilities to *"be sceptical and critical, able to cope with indeterminate work tasks and able to contribute to innovation (…)"*. This is particularly relevant in an economy where organisations face ill-defined problems for which a myriad of possible solutions exists. Apart from fundamental "cognitive skills" (e.g. attention, reasoning, processing), individuals must apply "transversal skills" in such an environment (e.g. problem solving, team work, collaboration) (Kiel, 2014). The OECD Innovation Strategy (OECD, 2010) highlighted several transversal skills that were relevant for innovation processes, such as critical thinking, knowledge application to unfamiliar problems, and a set of behavioural and social skills that helped to pursue opportunities and put ideas into practice (Davidsson,

2004; Van der Veen & Wakkee, 2006). Hence, the development of skills that enable entrepreneurs to pursue opportunities and realise their ideas fall into the domain of entrepreneurship education.

The literature proposes different approaches regarding entrepreneurship education programmes at universities. They differ with respect to their underlying understanding of entrepreneurship (Van der Sijde & Ridder, 2008). Some focus on it as starting a company and managing a small company where the learning outcome is the writing of a business plan to a specific target group (e.g. Financiers). Other programmes understand it as a process of realising opportunities, where teaching focuses on bringing opportunities to the market and the learning outcome, at the practical level, is the elaboration of resources in a business case or a business plan (Shane, 2004; Van der Sijde & Ridder, 2008). Others regard it as a set of competencies (Gibb & Hannon, 2006) involving entrepreneurial thinking and acting, where the learning outcome is the extension of the behaviour of the entrepreneur. In the context of this article, we refer to this last approach as educating for entrepreneurial thinking and acting. *Table 21* outlines the skills referred to in this article. We adapted them from literature on entrepreneurship, leadership and transversal skills development.

A promising approach to developing skills and competencies is through hands-on problem-based learning (PBL). Barrows and Tamblync (1980, p.1) define PBL as *"the learning that results from the process of working towards the understanding of a resolution of a problem (…) encountered first in the learning process"*. This pedagogical approach is part of inquiry-based learning (as opposed to direct instruction) and is based on the assumption that having learners construct their own solutions leads to the most effective learning experience. Barrows (2002) identifies four key components of PBL, namely (1) student-centred approach, (2) ill-structured problems, (3) teacher as facilitator, and (4) authenticity. PBL has been used for several decades. Although it has its roots in medical education (Barrows, 1986; Barrows & Tamblyn, 1980), it is now used in many disciplines to provide students with practical experience. In the European context, at Maastricht University in The Netherlands, PBL is at the core of its orientation to promote students who are entrepreneurial, problem-solvers and team players (Hoidn & Kärkkäinen, 2014, p.15). The Dutch Radboud University Nijmegen has also adopted PBL approaches to enhance skills in communication and cooperation (Goddard, 2007). In France, the Master in Social Sciences (MSC) in Management programme of EM Lyon Business School includes an entrepreneurial approach to PBL: students are required to create a virtual business project (Hoidn & Kärkkäinen, 2014, p.14).

Table 21: Overview of the relevant transversal skills

	Referenced definitions
Teamwork skills	*The ability to collaborate with others in diverse group settings* (Hughes & Jones, 2011)
Problem solving skills	*From a relational perspective: The ability to find a common ground and build rapport. From a task-oriented perspective: The ability to define and outline problems and to research the necessary information for its resolution* (Goleman, 1995)
Project management skills	*The ability to plan and manage project tasks and resources, and communicating the progress and results within a defined period of time* (Perce, 1998)
Communication skills	*The ability to understand, express and interpret concepts, thoughts, feelings, facts and opinions in both oral and written form (listening, speaking, reading and writing)* (European Council, 2006)
Foreign language skills	*The ability to understand spoken messages, to initiate, sustain and conclude conversations and to read, understand and produce texts appropriate to the individual's needs in a foreign language* (European Council, 2006)
Presentation skills	*The set of techniques and skills required in successfully presenting information to others* (De Grez, Valcke, & Roozen, 2009)
Self-management skills	*The ability to control or redirect disruptive impulses and moods and to suspend judgement – to think before acting* (Goleman, 1995)

From a learning perspective, social constructivist views on human cognition suggest that a cognitive architecture must *"account for the context, the learner and the processes of cognition (social and cognitive) in order to explain or predict cognitive activities"* (Jonassen, 2009, p.13). In this sense, learning also depends on social interactions, not only with instructors and classmates, but also with the learner's socio-economic context. The PBL approach involves an active participation of learners (Schmidt, 1983, 1993; Schmidt & Moust, 2000). Through this shift in focus, the learner benefits from developing and applying new knowledge by "learning by doing" (Blumenfeld et al., 1991). Notwithstanding the importance of practical training, direct instruction for students must be taken into account to develop value for what they experience. Hence, a balance between inquiry-based and direct instruction should be achieved (Kuhn, 2007). As stated by White & Frederiksen (2005)*"…students need to develop explicit cognitive models of capabilities needed for inquiry. Such models help students learn how to do inquiry, as well as to understand its nature and purpose"* (p. 212). (Duffy, 2009) argued in a similar way. He suggested that effective education required that the learner felt a concrete need to learn. Thus the instructions must be relevant for the learner's needs for "sense-making", which is the process whereby

people construct personal meanings for phenomena they experience (Dervin, 1992, p.63; Kari, 1998, p.3) *"There is a time for telling, but if there is not a need (it is not the time), little will be learned from that telling (…). The role of instruction is to support, not direct, that sense-making"* (Duffy, 2009, p. 358). From an entrepreneurial perspective, Morris et al., (2012) regarded continuous learning from experience as a key characteristic of entrepreneurs engaged in "sense-making". PBL is often configured as a project focusing on problem definition and solution strategies (Barron & Darling-Hammond, 2008). These problems drive the needs and requirements from learning. Therefore, a critical point in this approach is the kind of problems on which students must work. In this respect, Barel (2010) suggested that a major challenge came from creating strong ill-structured problems with great authenticity outside a formal learning environment that embodied the major concepts to be mastered and understood. Therefore, PBL in combination with a UBC project provides additional educational value for entrepreneurship when providing students with problems to be solved in a real-life business environment (Baaken & Gosejohann, 2009; Baaken et al., 2015). *Figure 7* depicts the elements of PBL embedded in the context of a UBC project.

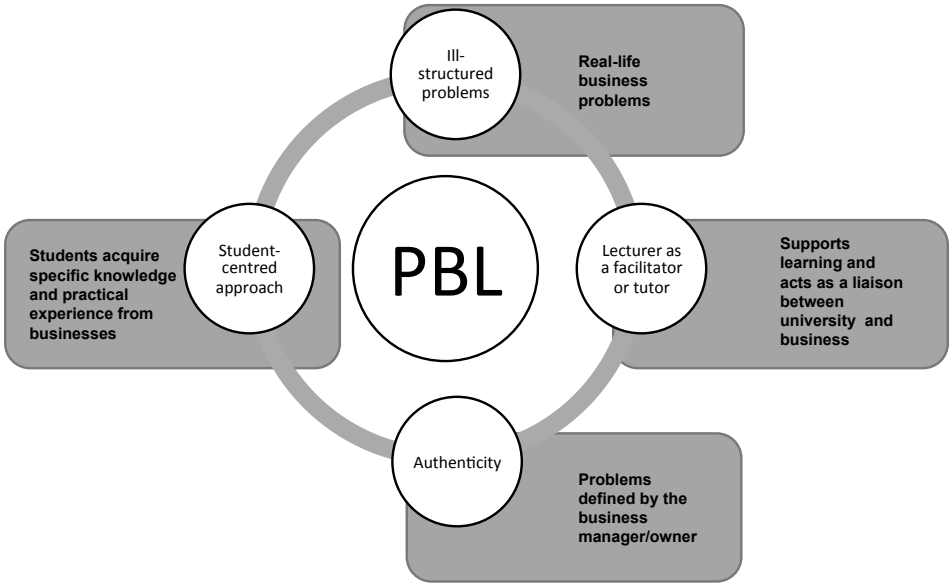


Figure 7. Components of UBC-based PBL (adapted from Barrows, 2002)

6.3 **Methodology**

To identify the effects of PBL in the course of UBC projects, we conducted a survey among students. We collected data from UBC projects applying PBL at one of the largest German universities of applied sciences which is well-established in its region, is of high renown for its engagement in UBC and regularly generates a very large amount of third-party funds from cooperating with businesses. External activities of this university include close interactions between the Faculty of Business Administration and businesses (both small and medium-sized enterprises) and larger companies) located in the region and beyond. They often consist in consultancy projects in which a group of undergraduate or graduate students works on a real-life case assigned to them by a company. These have been a core activity in curricula for more than two decades, in particular in English-speaking modules that target an international student group. The projects are coordinated by lecturers, usually professors and PhD candidates. To guarantee a solid theoretical background, they are part of modules featuring additional lectures, which provide the students with the basic knowledge on marketing and management required for a successful project implementation. The lecturers are responsible for establishing the first contact with interested companies and subsequently developing a longer-term relationship with the businesses. They are also in charge of defining the overall project objective with the business partner. The lecturer and the student group elaborate a basic project plan, including milestones and designated deliveries. Each of the weekly project sessions is timed and minuted by one student group member. This serves as a guideline for the further procedure and provides the business with regular information on the progress of the project. At the end of the semester, the students present the final results during an official meeting in the facilities of the business partner.

To research the effect of PBL on the development of the students' skills when confronted with real-life business problems, we carried out an online survey in 2012. It addressed current and former students who had participated in UBC-based PBL projects between 2004 and 2012. We contacted 628 project participants with an email, which included a link to the online questionnaire. Before starting the survey, we carried out a pre-test among students. This, together with feedback provided by professors who were experienced in such projects (expert validity) led to slight refinements and adaptations of the questionnaire. After two reminders, we received a total of 189 responses (29.6%). 150 of these were sufficiently complete to be part of the analysis. We carried out the analysis using SPSS 20. The students assessed their motivations and perceived benefits with respect to the UBC-based PBL projects in which they participated on a ten-point rating scale (1=lowest value; 10= best/highest value). These motivations and benefits were operationalized in terms of the transversal skills development. The scores of the initial "motivation value" were tabulated for correlation with the "benefit value" perceived by the students.

Understanding what motivates students to participate in such projects and their perceived benefits after participating is a primary factor that influences the students' experience of higher education and can provide important insights into the determinants of a graduate's career success. This approach is also relevant in order to understand the impacts of introducing and refining innovative teaching concepts, thereby also considering the students as one of the major stakeholder groups of an HEI.

6.4 **Results**

Based on the 150 responses, 45.3% of the participants were male and 54.7% were female, 54.7% were German native speakers, and 27.3% participated in more than one UBC-based PBL project during their studies. Given the changes in academic education through the Bologna Process, it is also important to note that 61.3% were bachelor students, 20.7% undertook a master course and the remaining 18% were participating in a UBC-based PBL project during their diploma (an academic degree in Germany prior to the Bologna process) studies at the time of the survey. *Table 22* outlines the respondents' ranking of the "motivations" and "benefits" they perceived. Their main motivations and benefits were "the acquisition of practical experience in a real-life project task" and "the development of concrete concepts that could be applied in business practice". The respondents perceived very low motivations and benefits with respect to "making contacts for the final thesis or for a future job". Their motivations and benefits were therefore largely focused on business practice applicability and the development of skills. The survey also examined the relationships between transversal skills in both "motivations" and "benefits". We observed that team-working skills correlated significantly with both problem-solving skills and project management skills, as shown in *Table 23*.

Table 22: Motivations and benefits perceived by project participants

	Motivations to participate in the projects			**Benefits perceived after the project**		
	N	**Mean**	**SD**	**N**	**Mean**	**SD**
Acquiring (more) practical experience in a real-life project task	146	8.29	1.86	145	7.72	1.93
Developing concrete concepts applicable in business practice	147	7.41	2.24	145	6.92	2.34
Acquiring new special knowledge	148	6.78	2.31	146	6.88	2.38
Improving problem-solving skills	147	6.48	2.39	146	6.68	2.26
Improving project management skills	147	6.33	2.52	146	6.66	2.33
Improving presentation skills	148	6.32	2.44	146	6.76	2.35
Improving teamwork skills	146	6.27	2.45	145	6.66	2.39
Improving communication skills	146	6.27	2.32	145	6.62	2.21
Improving your foreign language skills	146	6.12	3.01	143	5.62	3.02
Improving intercultural skills	147	6.10	2.96	144	6.14	3.26
Improving self-management skills	145	5.61	2.35	144	5.85	2.34
Acquiring an official practice partner certificate ("Company Certificate")	150	5.49	3.04	145	5.60	2.92
Making contacts for a future job	145	3.57	2.69	144	2.69	2.23
Making contacts for the final thesis	146	3.46	2.70	145	3.08	2.61

Table 23: Significant correlations

		Problem Solving Skills		Project Management Skills	
		Motivation	**Benefit**	**Motivation**	**Benefit**
Team working skills MOTIVATION	Pearson Correlation	0.590	0.519	0.526	0.516
	Sig. (2-tailed)	0.000*	0.000*	0.000*	0.000*
	N	146	145	146	145
Team working skills BENEFIT	Pearson Correlation	0.501	0.653	0.522	0.579
	Sig. (2-tailed)	0.000*	0.000*	0.000*	0.000*
	N	145	145	145	145

We also examined challenges for students and benefits for businesses, both measured on a ten-point rating scale, as we did for motivations and benefits. The most important challenges (see *Table 24*) were: difficulties in finding information for the project work (5.69), unbalanced allocation of the workload within the project group (5.20) and unclear and/or too extensive target definition on behalf of the business partner (4.78). The first referred primarily to the project group focus, whereas the last addressed the relation to the business for which the students were carrying out the project.

Table 24: Three main challenges from the point of view of the students

Challenges perceived during the project	**N**	**Mean**	**SD**
Difficulties in finding information for the project work	145	5.69	2.21
Unbalanced allocation of the workload within the project group	141	5.20	2.73
Complexity/difficult comprehensibility of the project topic	145	4.78	2.66

Table 25 presents the perception of the students with regard to the project-related benefits of the respective business partner. According to the students' view, businesses particularly benefited from obtaining new perspectives/different views from academia and a better understanding of their market environment and from acquiring new knowledge.

Table 25: Three main benefits for business, as perceived by students

Benefits for business	N	Mean	SD
Gaining new perspectives/different views from the students/ university	143	7.29	1.86
Acquiring new knowledge	142	6.44	2.21
Gaining a better understanding of their own market	142	5.78	2.28

6.5 **Discussion**

The findings outlined above point to four themes that are relevant for deriving policy implications:

6.5.1 Theme 1: UBC-based PBL provides students with a contextualised understanding of the knowledge acquired in the lectures

A learning environment in which stakeholders of the university, in particular students and businesses, are part of the educational process, leads to the experiential and contextualised understanding (Duffy, 2009; Lave & Wenger, 1991) of theoretical concepts. In this respect, businesses are beneficiaries of and participants in the education process. Such direct involvement of major stakeholders is particularly relevant when it comes to providing students with a contextualised understanding of the knowledge acquired in the theory-based lectures, (Baaken et al., 2015).

PBL aims at developing transversal skills, together with the appropriate discipline-specific knowledge, since the respective knowledge is acquired in the same context in which it is used later on (Barrows, 1986; Bransford, Brown & Cocking, 2000). In this case, business administration students are trained to work in business practice after graduation. According to Kuhn (2007), both direct instruction and inquiry-based learning need to be taken into account in the context of and in relation to educational goals. We therefore propose that if PBL includes dealing with real life business problems and is also part of a theoretical lecture section of direct instruction, students will perceive a great benefit of concept development for business practice, as reflected in *Table 22*.

6.5.2 Theme 2: UBC-based PBL enhances the types of problems students work on, thus triggering the need for collaboration

Table 23 shows the correlation between teamwork skills and problem-solving skills as well as project management skills, suggesting that the lecturer of UBC-based PBL must support learning by providing a teaching environment that promotes interaction among students to derive benefits that are related to the improvement of transversal skills, such as problem-solving and project management skills.

UBC-based PBL projects have the potential to enhance the "authenticity" of the problems that students solve (see *Figure 7*). For students, the major challenge perceived during the realisation of the project was the difficulty in finding information for the project work (5.69), thus, suggesting that the problems typically feature a higher degree of uncertainty, which

obliges the students to exercise their problem-solving skills. Thus, an important resource for universities is the collaboration with businesses, communities and local organisations. This approach, in turn, mirrors the outward orientation of the entrepreneurial university (Clark, 2004; Pinheiro, Langa, & Pausits, 2015; Siegel, Wright, & Lockett, 2007) which places special emphasis on the importance of relationships with the external environment. These findings are in line with a recent study on good practices for UBC (Davey et al., 2011a) where it was found that many actors needed to collaborate in order to deliver new and sustainable value to a region. In this case, universities, students and business needed to collaborate to deliver enhanced learning experiences that promoted the development of skills.

6.5.3 Theme 3: The role of lecturers in UBC-based PBL projects is to support learning and encourage social interactions among students and between universities and businesses to promote entrepreneurial behaviour

Lecturers teaching in UBC-based PBL projects act as facilitators of strategies and scaffolds for learning (Hmelo-Silver & Barrows, 2006) in response to the needs expressed by students according to the problem to be solved or the goal of instruction (Hmelo-Silver, Duncan, & Chinn, 2007). They need to create learning environments that allow students to make sense of what they learn and process the content so that they can apply their understanding to solve problems (Bransford et al., 2000). In this respect, the lecturers should act as liaisons between academia and business and as a node that supports students in applying theoretical concepts for solving real-life business problems. As illustrated in *Table 22*, "acquiring more practical experience in a real-life project task" and "concrete concepts applicable in business practice" are both the main motivators for students to participate in these UBC-based PBL projects and the main benefits perceived at the end of the project. In line with this view, several studies assert that entrepreneurial behaviours and the capacity to engage in entrepreneurial activity are highly context-dependent (Jayawarna, Rouse, & Kitching, 2013; Jones, 2014; Pugalis, Giddings, & Anyigor, 2014; Steyaert & Katz, 2004). Hence, collaboration with business partners can enrich education (Forsyth et al., 2009; Siegel et al., 2007) by providing a source of expertise and experience from actors in the university-external environment.

6.5.4 Theme 4: Students are motivated to learn and increase their skills

The results in *Table 22* call for further attention regarding the motivation of students who participate in UBC-based PBL projects. We found that students were more motivated by the acquisition of skills than by employability issues. This suggests that, while employability and skills matching are important, the students' subjective experience of higher education matters in determining their career success (Teichler, 2009). This may trigger a discussion regarding questions put by Teichler (2009, p. 295), such as *"To what extent do and should educational institutions 'respond' to presumed job requirements or be proactive actors of innovation and new configurations of competencies?"*.

6.6 **Implications, Limitations, and Directions for Future Research**

UBC-based PBL allows for the creation of networks, thereby stimulating social interactions among university stakeholders and enhancing academic education. Implications derived from our research mainly refer to the improvement of the collaboration process and issues of internal and external communication linked to this process. Concerning the improvement of

internal collaboration issues, the role of the lecturers in UBC-based PBL projects is a future focal point. Students identified the unbalanced allocation of the workload within the project group as one of the major challenges. This suggests that the role of the lecturers as facilitators is essential for the successful development of the project, especially when students are motivated and perceive a great benefit from participating in these projects, the teamwork and the collaboration aspects. To the question: "*What did you particularly like in the practice project you attended?"* most students stated that it was "the teamwork", and "collaboration in multicultural groups".

Our findings mirrored the perception of professionals in the HEI sector who considered practical training as an empowering tool for the development of soft skills (Pavlin, 2014, p. 583). This issue requires further attention in the PBL literature; specially addressing how interpersonal skills are enhanced by this instructional approach, and how these interactions among students should also be fostered and taught. Some students suggested that further improvements to this UBC-based PBL project should be the "organisation of the division of the teams at an earlier stage" and a "better definition of the tasks and roles among the group". This points to moderate improvement potential regarding the lecturers' organisation of the project and underlying soft skills with respect to mediating collaboration within the project groups.

Concerning the improvement of external collaboration and communication with the business partner, to make better use of the benefits of UBC-based PBL lecturers should encourage interactions between the students and their socio-spatial- economic context to support the development of entrepreneurial behaviours (Pugalis & Liddle, 2014). According to the students, "unclear and/or too extensive target definition on behalf of the business partner" was a challenge during the project work. Despite the rather moderately adverse effect of this challenge, lecturers may nevertheless put more emphasis on communication with both the students and the business to support the project progress for the benefit of all actors involved.

In this respect, academics play an important role in UBC, especially when it comes to adding value to the traditional university tasks: teaching and research. However, acting at the interface of academia and business practice is still not a natural role for many academics. Therefore, developing PBL projects with business partners for teaching purposes could be considered a process whereby academics start or intensify their entrepreneurial engagements and develop certain entrepreneurial skills that help to establish a network of contacts with businesses. Hence, the development of UBC-based PBL could be a good starting point for those universities and regions with a less developed ecosystem for UBC.

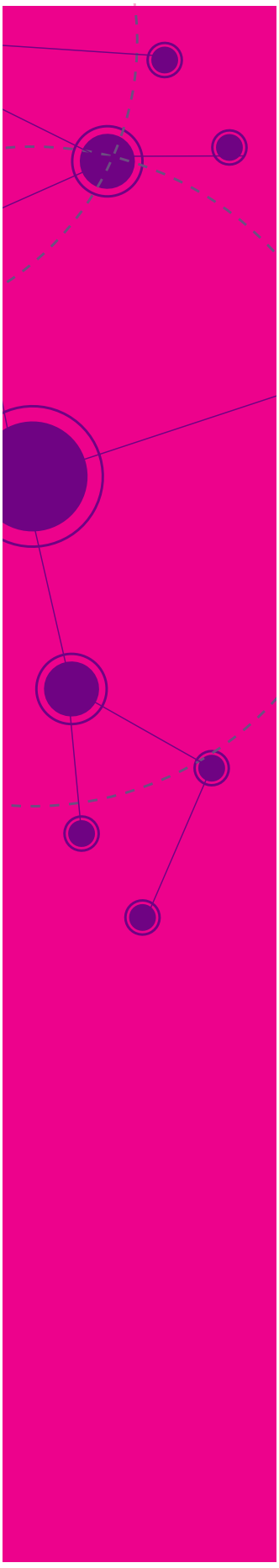
To sum up, it is evident that UBC-based PBL projects involve several actors with partly different views and objectives – the students, the business, the lecturer and the university (or, more precisely the study programme director). To further develop such projects and intensify UBC activities, the overall challenge lies in meeting the specific benefit expectations of all the actors involved. Taking into consideration the needs of students, in terms of competencies and skills, does not limit education to utilitarian reasons to satisfy employers' needs. However, universities prepare students not only to solve particular business problems, but also to be change agents who are able to address societal problems. This vision also follows the view of other scholars (Audretsch, 2002; Galloway, Anderson, Brown, & Wilson, 2005) who suggested that addressing the needs and concerns of society as a whole was perhaps what made the university one of the most resilient institutions in society. In this respect, one should not neglect the fact that not all kinds of university interactions may focus on practical

applicability and business needs. Instead, the public responsibility of universities also requires basic research activities and taking into account the academic freedom of researchers. In the best case, lecturers' engagement in such projects may be in line with their research focus (Lam, 2011; Perkmann & Schildt, 2015) and thus correlate with academic freedom (Slaughter & Rhoades, 2004).

Since the data used in this study were collected in the framework of a single setting, our research suffers some limitations. Further studies may benefit from a sample that includes students from different universities and contexts to test for the effects of UBC-based PBL on the students' skills development. The benefits perceived by students regarding the effects of the project on their skills were self-reported. Future research could concentrate on developing a more objective measure of entrepreneurship behaviour and also focus on the perception of lecturers and business representatives. Such research may focus on the competencies and skills that lecturers of UBC-based PBL need to support adequate learning, as well as the implications for universities and their role in providing training for their academics developing a dual role (Van der Sijde, David, Frederik, & Redondo-Carretero, 2014).

Part C.

Conclusions



Chapter 7 Discussion and conclusions

The main purpose of this chapter is to provide a final synthesis of the research findings in order to reflect upon the implications of this dissertation for theory and practice as well as to highlight limitations and future research avenues.

The thesis has demonstrated that there has been little discussion of academic entrepreneurship within the context of the teaching practices of academics (educators), particularly when executed with external actors. Additionally, it has also demonstrated that sociological approaches to the phenomenon of academic entrepreneurship can bring additional insights into the value-creating activities of academics achieved via the interaction with others. This research provides contextualised explanations of how academics' entrepreneurial behaviour is subject to the broader conditions affecting social interactions.

By referring to the streams of literature on networks, social capital and entrepreneurship, this thesis has argued that academics might engage in interactions with others in order to enhance existing resources needed for entrepreneurial endeavours in an academic setting. Hence, in order to achieve the main research objective, this thesis decided to focus on the entrepreneurial behaviour of academics from a social networking perspective. On the basis of this central argument, and some specific gaps in our knowledge, four main theoretical debates were addressed at the beginning of the thesis. Therefore, the following discussion is aligned with the answers to the sub-questions of this research addressing the main theoretical debates of this dissertation.

7.1 Discussion aligned with Debate 1: Factors affecting academic entrepreneurship within universities

Considering the basic process model of entrepreneurship (see *Figure 1)* one might assume that most research into the factors affecting academic entrepreneurship would be dedicated to studying the interaction between the individual and the environment process levels. On the contrary, the two levels are mainly studied separately, resulting in two streams of literature that have explained either the factors at the individual level (e.g. D'Este et al., 2012; D'Este & Patel, 2007; Lam, 2011) or the factors at the organisational level (e.g. Clarysse et al., 2011; Siegel et al., 2003).

Evidently, both individual and environmental factors are necessary components of the entrepreneurial process, but considered separately are not sufficient to explain academic entrepreneurial behaviour as a whole. The individual level is of major relevance, but not a sufficient condition for academic entrepreneurship. In considering the individual, other organisational related factors of academic entrepreneurship, such as the cooperation with others, are ignored. Moreover, research on entrepreneurship has questioned whether personal traits and characteristics of entrepreneurs can explain entrepreneurship (Davidsson, 2005; Gartner, 1990; Shane & Venkataraman, 2000). On the other hand, while providing an environment that promotes academic entrepreneurship is necessary, it is not sufficient. An academic entrepreneur is certainly needed. Thus, it seems that the isolated consideration of factors at the individual and the environmental levels of academic entrepreneurship will not further advance the understanding of the phenomenon. Rather, a more integrated approach is required that converges both levels. As such, a sociological perspective was brought to the field of entrepreneurship within the context of the university to explain how entrepreneurial

behaviour is affected through social interactions and connections with others (Bourdieu, 1986; Coleman, 1988; Lin, 2001). In this context, this research has found that entrepreneurial behaviour within the context of the university is affected by (1) factors at the environmental level and (2) factors at the individual level.

7.1.1 Factors affecting academic entrepreneurship within universities at the environmental level

In Study 1, Chapter 3, the answer for the first research sub-question of *"What roles do barriers and drivers for university-business cooperation (UBC) have in academic entrepreneurship?"* is presented. The results of study 1 suggest that academics' entrepreneurial activity is subject to the broader conditions affecting their cooperation with business, with ***"Drivers for such cooperation (Drivers for UBC)"*** playing a large and significant role on the academics' entrepreneurial activity. These results suggest that academic entrepreneurship also depends on collective action, where academic entrepreneurs draw upon local, regional, sectorial and/or professional communities to assemble the necessary resources for entrepreneurial endeavours (Schoonhoven & Romanelli, 2009); in this case the business community plays a large role in this respect.

The national and regional context of the academic entrepreneurs plays a significant role. This not only applies to the differences in the role played by UBC "Barriers" and "Drivers" in the researched countries, but also in the differing ability of UBC barriers and drivers to explain the extent of academic entrepreneurship at all in those countries. For example, for the academics in Poland, neither the "Barriers for UBC", nor the "Drivers for UBC" played a significant role in their academic entrepreneurial activity.

Study 1 contributed to the general entrepreneurship literature arguing that context matters in being entrepreneurial (Etzkowitz & Leydesdorff, 2000; Siegel et al., 2003) and specifically in the case of academic entrepreneurship (De Silva, 2012; Van Dierdonck et al., 1990). Investigating the role of context for academic entrepreneurship within a context of cooperation, such as UBC, offered an in-depth understanding of the degree to which "Barriers" and "Drivers" for UBC interplay with the national context to affect the extent of entrepreneurial activity by academics. Furthermore, it also offered an understanding of how academic entrepreneurs and their value-creating activities are uniquely embedded in their context, which is composed not only by the university environment, but also by the wider national and regional context in which universities are embedded.

These results further support the conceptualisation of the university as a permeable institution (Bienkowska et al., 2016) subject to the wider social system in which it is embedded. This permeability not only supports the flow of persons and knowledge to stimulate creativity and entrepreneurial behaviour, but also, as the results from Study 1 revealed, can be a liability for academics willing to undertake entrepreneurial endeavours; particularly when the national and regional context does not have sufficient resources to support integrated initiatives for UBC and academic entrepreneurship.

A clear example in this respect is how engagement in entrepreneurial activities by Polish academics could be explained by other factors; potentially, the country's recent history as a society in transition from a former centrally-planned system (Jasinski, 2010; Teczke & Terblanché, 2013), as well as its degree of economic development that positions it as an emerging economy. Emerging economies (e.g. Poland), when compared with developed

nations (e.g. Germany), face relatively higher levels of resource scarcity at the national level that are important for academic entrepreneurial activity and UBC, such as the number of researchers per 1 million people, government spending in R&D as a % of GDP, high technology exports and patent applications by residents (World Bank EdStat, 2014). These macro-conditions also position Poland as an economy recently embracing a more market-oriented perspective in the production of science (e.g. UBC) (Jasinski, 2010).

7.1.2 Factors affecting academic entrepreneurship within universities at the individual level

Study 2 in Chapter 4 makes use of key premises from social capital theory (Bourdieu, 1986; Coleman, 1988; Lin, 2001), social cognitive theory (Bandura, 2001; Bandura, 1988) and field theory (Lewin, 1951) to further reason the role of individual-level factors on the entrepreneurial behaviour of academics within the context of the university.

Study 2 answered the second research sub-question of *"to what extent does the networking competency of the academics affect their entrepreneurial engagements with external actors within the context of education?"* According to Bandura (1988), people are both products and producers of their environment, therefore the entrepreneurial behaviour of academics can be understood as a function of a triadic, dynamic, and reciprocal interaction of personal factors, behaviour, and the social network (system) (Bandura, 1988). A key element to understanding this relationship was to set the perceptions of individuals at the front end of the discussion.

For this reason, study 2 focused on understanding how, and to what extent, perceptions of the academics' environment as well as perceptions on their own self-efficacy would affect their engagement in entrepreneurial activities with business for the purpose of creating novelties in teaching. In order to find the answer to that question, study 2 depicted the environment of the academic as a social structure, composed by structural, relational and cognitive elements that promote interactions between academics and business people and the formation of social capital among them. The self-efficacy of the academic was researched with respect to her networking competency to handle UBC relationships.

The results from study 2 suggest that an academics perception of their environment and of their own networking competencies to engage in UBC, are determinant factors in explaining the extent of development of UBC-based teaching. With respect to the academics' perception of their environment, academics need to perceive a high degree of development of relational social capital. This means that academics undertaking UBC within the context of education need to perceive an environment of trust, communication and shared goals in order to engage in such entrepreneurial endeavours. These results highlight and support the important role of human relationships for entrepreneurial endeavours for UBC (Davey et al., 2011b; Galan-Muros, 2016), particularly within the context of education.

By identifying the academics' perception of the relational dimension of social capital as a determinant factor for UBC-based teaching, strong and quality ties between academics and business people are characterised as a valuable resource for cooperation within the teaching mission of the university, beyond the immediate exchange of deficient resources. With the importance of nurturing and developing quality and strong relationships with actors in the external environment, this research has extended the literature with respect to the factors affecting academic entrepreneurship at the individual level. Besides the relevance of personal and professional attributes of academics, such as age and position, gender, knowledge, skills and motivation for entrepreneurial endeavours (D'Este et al., 2012; D'Este & Patel, 2007;

Lam, 2011), their ***self-efficacy*** with respect to their ***networking competency,*** particularly in the context of handling UBC relationships, is also a relevant factor that explains the extent of development of UBC-teaching as a manifestation of academic entrepreneurship.

The results from study 2 suggest that the academic's self-efficacy in regards to her networking competency to undertake UBC activities significantly affects the extent of development of UBC-based teaching, which confirms that besides the environment as a key element explaining entrepreneurial behaviour among academics (as shown in study 1), the perceptions of the academics play a large and significant role in their entrepreneurial behaviour within the context of teaching, particularly when this entrepreneurial behaviour involves collaboration with others.

In line with the central tenet of social cognitive theory, the entrepreneurial behaviour of the academic within the context of teaching is subject to the interaction of the environment (social structure) and personal factors (self-efficacy) (Bandura, 1997). Nevertheless, the academic's self-efficacy mediates the relationship between relational aspects of UBC and the extent of development of UBC-based teaching. This mediating role of an academic's self-efficacy with respect to networking competency suggests that self-efficacy plays an important and highly significant role, not only in the extent of development of UBC-based teaching; but also, in respect to the relational aspects that drive this form of cooperation in teaching practices.

These results called for a further in-depth understanding of how networking helps academics in their entrepreneurial endeavours within the university and in a teaching context. To this end a social networking perspective with a qualitative approach was adopted and implemented in study 3, Chapter 5. This study focused on the academics' proactive attempts to develop and maintain personal and professional relationships with others for the purpose of mutual benefit in the creation and execution of novel teaching practices with external actors.

Study 3 analysed the networking behaviour of academics through a composite construct denominated their ***"networking behaviour"*** (Forret & Dougherty, 2004; Stam, 2015; Vissa, 2011, 2012) in order to address the third research sub-question of *"how does the networking behaviour of the academics affect their entrepreneurial engagements with external actors within the context of education?"* Study 3 concludes that academic entrepreneurs as "entrepreneurial educators" make use of different networking actions along the entrepreneurial process of forming and implementing their teaching practices in cooperation with external actors.

During the opportunity recognition stage, their networking behaviour helps academics to achieve proximity with the external actors. Through physical and/or digital affordances, academics cross structural barriers to keep in touch with the external environment of the university and to keep themselves informed on what happens outside the university, this information serves as a source of opportunities to innovate their teaching practices. During the opportunity development stage, a strategic networking behaviour is more evident among academics. The use of digital and/or physical affordances to achieve structural proximity with external actors and a set of strategic behaviours that characterize their networking behaviour turned out to be essential to acquire resources and in particular the required legitimacy among all stakeholders of the teaching practice.

The generation of legitimacy turned out to be one of the most important and valuable resources for the implementation of novelties in teaching with external actors of the university. This resource is not given to academics; it is instead generated through their networking behaviour. By looking at how academics could generate the necessary legitimacy for their innovations in teaching from a social networking perspective, the entrepreneurial and industrial experience (experience in the non-academic environment) of the academic emerged as an essential factor in the opportunity development stage. Having experience in a non-academic environment, such as in industry or as an entrepreneur helps academics to bridge the cognitive and relational barriers with external actors, because it generates a greater understanding of the counterpart's environment, which in turn creates greater stakeholder awareness and a refined strategic intent to foster the development of cooperative relations for the achievement of mutually beneficial outcomes.

This is an interesting finding that adds new insights into the literature on social networking (De Janasz & Forret, 2008; Forret & Dougherty, 2001; Forret & Dougherty, 2004; Stam, 2015; Vissa, 2011, 2012) and to the previous studies in UBC highlighting the role of "previous experience" in the opposite non-academic environment (Korff, 2014; Korff et al., 2014; Plewa et al., 2013b; Plewa et al., 2013a). Study 3 has shown that besides the existence of digital and physical affordances to create proximity in space and time with external actors, having experience in the non-academic environment constitutes an affordance to network with external actors of the university. Experience in the opposite non-academic environment creates cognitive and relational proximity with external actors within the context of UBC.

These findings extend what we knew about factors affecting academic entrepreneurship. When academics engage in other modes of entrepreneurial activities, such as within the context of their education duties, the factors that affect entrepreneurship within the context of the university also account for the factors that affect the quality of the relationships academics establish with their external environment (Plewa et al., 2013a). These external relationships that academics establish with their external environment resemble what Clark (1998, p.5) denominated as the "extended developmental periphery of the university". This characteristic takes imperative relevance in the age of collaborative innovation where, according to Lundvall (1992), the innovation process is one where individuals and organisations interact engaging in information exchange, problem solving and mutual learning, thus establishing "relationships" that might be seen as constituting "innovation systems". Hence, instead of treating the relationships of universities and external actors as separate organisational spheres, this research has looked at the networking behaviour of actors who cross institutional boundaries and form "innovation systems" for the education mission of the university. Therefore, "networking" becomes a key strategic element of the behavioural repertoire of the academic entrepreneur, as it enables academics to create strong and quality networks for cooperation.

7.2 Discussion aligned with Debate 2: The extension of the field of intrapreneurship to the context of the university

Entrepreneurship in this research has been defined on the basis of the work from Stevenson and Jarillo 1990, p.23) on entrepreneurship within organisations, who defined entrepreneurship as *"the process by which individuals – either on their own or inside organizations – pursue opportunities without regard to the resources they currently control"* and it has been complemented with the work from Shane and Venkataraman (2000) and

Eckhardt and Shane (2003, p.336) to define entrepreneurship as a value-creating process through the assembling of new means-ends relationships.

This definition set three main principles that guided this research: (1) that the essence of entrepreneurship is opportunity-pursuit; (2) that entrepreneurship is a value-creating process that can take place in any type of organisation and (3) that entrepreneurs do not need to be considered as "solo-heroes" who possess all experience and resources required to exploit opportunities.

Based on these principles, in study 1, chapter 3, the context of the academic entrepreneur is presented as an important variable in understanding the entrepreneurial behaviour of academics. The results from this study show that, while it might be evident that the individual academic entrepreneur – or group of academic entrepreneurs – plays a major role in the entrepreneurial process, academic entrepreneurs acting within the university context– in clear contrast to independent entrepreneurship –need to take into account the organisation as a given variable. Their organisation influences the type of opportunities they pursue. This is because opportunities are relative as they vary among individuals and for individuals over time, because "*… they have different desires and they perceive themselves with different capabilities …*" (Stevenson and Jarrillo, 1990, p.23). Within the university context, academic entrepreneurs are constrained in the type and number of opportunities they can pursue due to their role as academics. This role sets for them their position and expectations and hence constrains their desires.

This fact is evident in study 3, chapter 5, where academics are networking with pre-established objectives and strategic intentions specific to the role that they need to fulfil as educators. For example, the entrepreneurial educators interviewed in study 3 were highly motivated to provide added value to the learning experience of the students and this motivation guided their strategic intents in their networking activities. Hence, as a result, academics would look for external actors who could be role models for the students or who benefit the learning experience of the students.

In the same line, the opportunities they will pursue will also vary among the population of academics because academics (individuals) perceive themselves with different capabilities. The results in study 2 suggest that the perceptions of academics about their self-efficacy to handle networking activities with business would have a significant effect on their engagement in UBC-based teaching. Therefore, variations in self-efficacy – their own perception about their capabilities – can be a source of variation in the opportunities pursued and exploited among the population of academic entrepreneurs.

The university context not only influences the type of opportunities academics pursue, but also shapes the nature of their value-creating activities. Study 3 shows that due to their role as educators, academics' strategic intents are motivated to the "creation of something of value" to a given community, in this case to their main stakeholders – the students. Additionally, as the novelties in teaching that served as the empirical cases for study 3 are executed in cooperation with external actors, academics are also motivated to offer value to them. Therefore, within the context of the university and within the teaching mission of the university, academics create value for a certain community. Therefore, entrepreneurialism within the university cannot only be centred on the creation of economic value, but also of social value, where academics and business people can exchange knowledge in diverse forms (Lamichhane & Sharma, 2010; Teixeira & Mota, 2012), such as through education-based

collaborations (e.g. Caniëls & van den Bosch, 2011). These knowledge-exchange collaborations create new means-ends relationships, adding value to the education mission of the university and to the business, by engaging in a knowledge circulation process. The results in study 4 (chapter 6), suggest that education-based collaboration with business enhances students' employability and entrepreneurial skills. To this end, the cooperation between academics and business generates social value reflected in new types of knowledge and new or different ways of working, such as new ways of teaching.

These results extend the study of one of the most important facets of intrapreneurship – *organisational self-renewal* (Covin & Miles, 1999; Zahra, 2007) to the context of the university. Covin and Miles (1999) have noted that "*renewal"* refers to changing and improving the relationship with the external environment; which might be the reason why "Drivers for UBC" positively and significantly affect the development of academic entrepreneurship, as shown in studies 1 and 2. When academics enact themselves in order to assemble the necessary resources for entrepreneurial endeavours, it is not only the resources they receive that explain the successful exploitation of opportunities, but also the fact that they are engaging with the external environment to obtain information they need to align their research (also embodied in products and services) or their teaching activities with the requirements of the external environment (private or public organisation, or future employers).

Therefore, by examining the phenomenon of academic entrepreneurship through the "intrapreneurial" lense, the pro-active engagement of academics with the "external environment" becomes a key behavioural characteristic of academics acting as entrepreneurs within their organisation (university). In this way, it reinforces what was found in studies 2 and 3 with respect to the role played by the networking competency and networking behaviour of academics. While networking with academic peers within their university is important for academics (as shown in the interviews from study 3, chapter 5), their interactions with the external environment become the source of ideas and new value creation in the form of *organisational renewal*.

Foremost, in the case of academics, their experience in multiple professional fields helps them to extract the value of their interactions with other individuals in external organisations due to the cognitive and relational proximity that it creates, as shown by the results in study 3. Due to the qualitative approach adopted in study 3, the findings of this study could be related to institutional work (DiMaggio, 1988), particularly on how individuals with multiple institutional logics (Thornton, 2004) are better equipped to understand their counterpart's environment, thus creating a greater stakeholder awareness to foster the development of cooperative relations for the achievement of mutually beneficial outcomes.

These findings highlight the important role of the external environment for intrapreneurial endeavours. Entrepreneurs by nature seek to exploit external opportunities embedded in their environment. As Schumpeter (1934) noted, it is the essence of entrepreneurship to capitalize on environmental change. Thus, in the uncertain environment that university executes nowadays, academic entrepreneurs must capitalise on their social environment, engaging in social networks with external actors that can provide them with advice, resources, experience and information to exploit opportunities within the university environment, such as the commercial exploitation of the results of their research or the introduction of novelties in teaching (Mustar et al., 2006; Vohora et al., 2004).

To this end, this research has responded to scholars in the corporate entrepreneurship and intrapreneurship fields, with respect to the role of personal and organizational networks in the intrapreneurship process; (Hayton & Kelley, 2006; Kelley, Peters, & O'Connor, 2009) (as shown in study 3, Chapter 5) the role of national and institutional factors influencing processes in Intrapreneurship (Dess et al., 2003; Hayton et al., 2002) (as shown in study 1 in chapter 3); and in general, the extension of the intrapreneurship field to not-for-profit institutions (Fini et al., 2012; Hayton, 2005).

7.3 Discussion aligned with Debate 3. A broader understanding of the concept of academic entrepreneurship

The third debate to which this dissertation has contributed concerns the concept of "academic entrepreneurship" itself. By referring to the entrepreneurship literature (Eckhardt & Shane, 2003; Shane & Eckhardt, 2003; Shane & Venkataraman, 2000; Stevenson & Jarillo, 1990; Van der Veen & Wakkee, 2006), this thesis has argued that academic entrepreneurship should be considered as a process whereby academics pursue opportunities for the creation of new value in cooperation with non-academic actors; with the environment of the academic entrepreneur playing an important role in the advancement or stagnation of the entrepreneurial process.

A broader understanding of academic entrepreneurship as a process helped to address the individual behavioural elements of entrepreneurship (mostly addressed in studies 2 and 3), and at the same time acknowledged the highly significant role of the environment in driving or hindering this process (mostly addressed in study 1). This approach was particularly useful in understanding the networking behaviour of academics in relation to their entrepreneurial behaviour in study 3.

A process view of entrepreneurship supported the understanding that "networking" is a complex composite construct and that every single resource needed for opportunity exploitation requires a unique set of networking mechanisms. The results in study 3 propose that the networking actions implemented vary according to the stage in the entrepreneurial process. For example, while achieving structural proximity with external actors is crucial in the opportunity recognition stage, in the opportunity development stage, the generation of cognitive and relational proximity with external actors is crucial to generate the required legitimacy in front of external actors that participate in teaching practices.

Adopting a broader understanding of academic entrepreneurship does not discriminate the involvement of academics in spin-off creation. For this reason, this activity was also considered in the first study of this research. However, there were found to be substantial differences between studies 1 and 2, in terms of the benefits derived from UBC for academic entrepreneurship, depending on the type of academic entrepreneurial activity in place. In study 1, for example, drivers related to *having access to complementary resources with business* and *drivers related to having an integrated mission for UBC* positively and significantly affected the development of academic entrepreneurship when manifested in the creation of spin-offs. Conversely, the results from study 2 show that when academic entrepreneurship is manifested in education activities, such as in UBC-based teaching, neither the structural component of the environment, nor the cognitive elements embracing a mission for UBC in the university play a significant role in the extent of entrepreneurial engagement of academics. However, relational aspects of the cooperation that are embodied in the

individuals, such as existence of mutual trust, trustworthiness of the actors, existence of a shared goal and mutual commitment of both actors, play a highly significant role.

These results suggest that in order to derive conclusions on the benefits of UBC on academic entrepreneurship, one must take into consideration the type of academic entrepreneurial activity as a contingency. These results partly reinforce existing insights in the literature on entrepreneurship and networks that have taken the contingency approach to reconciling the different views on network benefits on entrepreneurship (Elfring & Hulsink, 2003). For example, in their study, Elfring and Hulsink (2003) introduce the level of innovation as a new contingency, finding that according to the kind of innovation (radical or incremental) a different set of strong and weak ties is needed. Similar results can be derived from this research with respect to the type of academic entrepreneurial activity. While the creation of spin-offs requires a higher commitment of resources, the creation of innovations in teaching is less resource-intensive and more dependent on the personal relationships of academics.

Therefore, within the debate dedicated to the broader understanding of academic entrepreneurship, a key contribution is to consider entrepreneurship as a process of opportunity pursuit for new value creation. This approach helps in the understanding that the benefits derived by UBC vary according to (1) , the type of opportunity and mode of exploitation (innovations in teaching or creation of spin-offs) and (2), the stage of the entrepreneurial process.

On the one hand, the consideration of the different manifestations of academic entrepreneurship moderates the debate on the benefits derived from UBC for academic entrepreneurship. On the other hand, the consideration of entrepreneurship as a process of opportunity pursuit supports the understanding on how networking as a practice is strategically executed according to the stage of the entrepreneurial process. Therefore, one might find variations on the networking mechanisms deployed by academic entrepreneurs according to the resources needed at each stage.

7.4 Discussion aligned with Debate 4. Effects of academics' entrepreneurial activities on the education mission of the university

Study 4 (Chapter 6) of this dissertation, provided the answer to the fourth research sub-question of *"What are the effects on teaching of academics' entrepreneurial engagements with external actors?"* The effects of the entrepreneurial engagements of academics on the education mission of the university can be explained in terms of the contribution they make to the enhancement of the learning experience of students.

At the core of this fourth debate is the discourse about the desirable character of teaching and learning. On the one hand, pedagogical ideas stress that the goal of teaching and learning should not be defined in terms of the abilities attained at the end of the teaching and learning process, as exhibited in a job or other life spheres, but rather on the acquisition of knowledge for its own sake. On the other hand, popular terms such as "employability", "competencies" (Blömeke et al., 2013) and "learning outcomes" are used to underscore such a call for output awareness in higher education. Views differ concerning whether or not such a shift from attention paid to the acquisition of knowledge towards attention focusing on competence leads to a stronger emphasis being placed on the relevance of teaching (Cummings and Teichler, 2015). To address this debate, this research considered the idea that the relevance of teaching can also be judged from the perspective of the students, valuing their subjective

experience during their studies.

Hence, the contribution of this research has been to focus on the effects of the entrepreneurial engagements of academics on the actual learning experience of the students, that is to say to focus more on *how* knowledge is being delivered and acquired, and not on *what* is being delivered and acquired. From the students' perspective, *"the acquisition of a more practical experience in a real-life project task"* and *"the concrete application of concepts in business practice"* are both the main motivators for students to participate in these UBC-based education formats and the main benefits perceived at the end of the course. As was seen in study 3, chapter 5, these results are in line with the benefits for the students, as perceived by educators, who consider their teaching practices to contribute to the development of students' entrepreneurial competencies when faced with real problems and in the application of knowledge in real practice.

The debate on whether academics' entrepreneurial engagements are beneficial or detrimental to their teaching duties can be moderated by integrating these engagements into regular teaching activity, thus transforming and innovating their work, rather than considering an academic's entrepreneurial profile as something additional, for which they face resource constraints as they attempt to balance academic and entrepreneurial activities (e.g Wright et al., 2004).

That kind of integration among the duties of academics, has been advocated by many scholars within the field of higher education, who argue that teaching, research and activities related to serving their community are interrelated activities that are useful and enriching for students and academics' learning and for the professional growth of their teaching and research duties (Greenbank, 2006; Karlsson & Booth, 2007; Culum, 2015).

On the other side of the story, some challenges still remain in the execution of these teaching practices in collaboration with external actors. According to the students, *"unclear and/or too extensive target definition on behalf of the business partner"* was a challenge during the project work. Therefore, in order for students to derive positive effects in their learning experience from these engagements of academics with business, constant communication with a business partner in the context of teaching practices is a key driver in achieving benefit for all actors involved. This constant communication creates a common understanding on the goals to be reached at the end of the teaching practice. These results from the perspective of the students mirror the results of study 3 in chapter 5 from the perspective of the educators. *Constant communication and a common understanding with external actors* are key drivers for the successful execution of UBC-based teaching practices. These results extend our understanding of the factors affecting UBC in the context of education, as prior research on UBC has mainly focused on research-based cooperation (Barnes et al., 2002; Korff, 2014; Plewa & Quester, 2008).

Therefore, the networking behaviour of academics is not only relevant for their entrepreneurial endeavours, but also for the generation of positive effects on the learning experience on the students. As shown by the results from studies 3 and 4, *constant communication and a common understanding with external actors* do not happen out of the blue, but are essential drivers fostered and nurtured by the proactive networking behaviour of the entrepreneurial educator. In this line, this research has also addressed the call from Perkmann et al. (2013) and Davey (2015) on the need to further research education-driven academic engagement with external actors.

7.5 **Contributions to theory**

Figure 8 below summarises all factors included in this dissertation that have been theoretically and empirically analysed as having an effect on the entrepreneurial behaviour of academics within the context of UBC-based education, as well as the effects of the entrepreneurial behaviour of academics in teaching.

Social capital theory, social cognitive theory, field theory, literature on entrepreneurship and entrepreneurial social networking concepts aided in understanding and deriving theory applicable for the entrepreneurial behaviour of academics within the context of UBC. Thus, insights from studying entrepreneurial behaviour within the context of an academic setting can be transferred back to these literature strands and thereby contribute to their advancement.

In understanding and advancing academic entrepreneurship and UBC theory and literature, networking as a practice of the individual academic entrepreneur seems to be a significant indicator of the extent of development of teaching practices that are implemented with business; a teaching practice that is recognised as a novelty in teaching (Hasanefendic et al., 2016). Not only does the effect of the self-efficacy with respect to the academic's networking competency to undertake UBC activities and her networking behaviour present key insights into UBC and academic entrepreneurship literature, but it also contributes to the understanding of social capital formation and accumulation between academics and business and therefore to the social capital and entrepreneurial networking theories.

The significant role played by the self-efficacy of academics' networking competency, along with the way in which their networking behaviour influences entrepreneurial activity, as discussed in chapters 4 and 5, portrays academics as, as reflective agents who endogenously decide on, and are practitioners of networking practices that shape their collaborations and, ultimately, their social capital. Hence, academic entrepreneurs are not only the subjects of specific structural network configurations. Furthermore, they can also be considered strategic actors that intentionally pursue valuable new connections. Hence, this study has helped to understand the underlying endogenous practices by which entrepreneurs attempt to organise their social capital in the first place.

The extension of factors to be considered in academic entrepreneurship within the context of UBC refers to the individual practices of academics that form and shape their networks with business people. In this case, the individual practices refer to the networking practices of academics. Therefore, the proposition of D'Este et al. (2012) and Davey (2015) to consider other factors affecting entrepreneurship at universities needs to be extended by the networking behaviour of academics in this respect.

Developing theory on the actual practice of entrepreneurship within universities is useful in order to harness and foster entrepreneurial behaviour among academics on a continuous basis, as opposed to randomly-occurring academic entrepreneurial activities, which are highly dependent on the personal initiative and personal contacts of the academics. Harnessing and fostering entrepreneurial behaviour within organisations and through interorganisational collaboration are also relevant aspects of intrapreneurship and corporate entrepreneurship in all kinds of organisations. The findings therefore advance this literature strand as well.

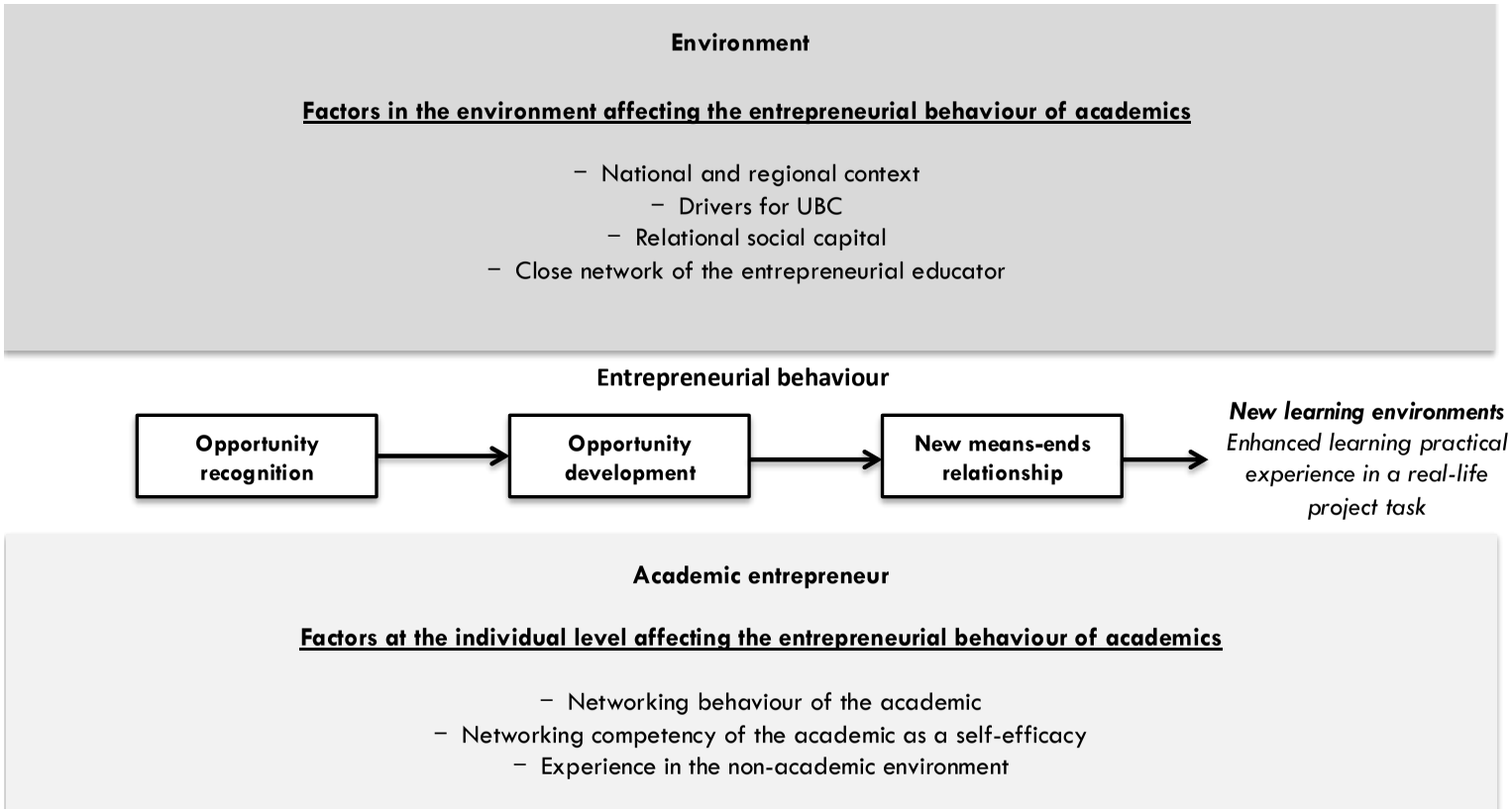


Figure 8. Summary of results

7.5.1 Managerial Implications

In addition to the theoretical contributions highlighted above, this dissertation holds practical implications. As such, universities willing to foster and harness entrepreneurial behaviour among academics demand novel perspectives on the management of the university.

As discussed above, academic entrepreneurship should be understood as a value-creating process that can be manifested in different forms; from academic-spin-off creation, to the introduction of novelties in teaching to create value for the students, the university and all actors involved. When it comes to fostering academic entrepreneurial behaviour among academics in less developed countries, the multilevel nature of the process of entrepreneurship suggests that a context-specific understanding of academic entrepreneurship is needed, in order to develop the required capacities that would develop effective social and economic benefits. Academic entrepreneurship, when manifested in the commercialisation of research and spin-off creation, is a more resource-intensive activity, where the resource status of the country will impact the nature of this activity. Therefore, countries with a less developed ecosystem for UBC and academic entrepreneurship should start their interactions with business in the education domain, and gradually increase the degree of involvement of resources and hierarchical levels of the university.

This approach will, in time, support academics to develop their competencies in handling these relationships with business gradually, shaping with it the academic's self-belief in their ability to perform UBC activities. These implications suggest a new mix of approaches to the professional incentive system for knowledge transfer activities in the university, in order to foster desired behaviours, such as their engagement in UBC within the context of education. Besides innovating and implementing motivation strategies for engaging academics in UBC, this research has demonstrated that behaviour and the environment enjoy a bidirectional relationship, thereby it can be developed through coaching of managers. In this respect, it calls for innovative practices among human resources managers in universities.

With the relevance of relational aspects that drive the cooperation with business for the entrepreneurial endeavours of academics, universities should focus on creating more sustainable relations between the two organisations. Therefore, managers should not only encourage the interaction between academics and business people, but should furthermore foster the strength and quality of the relationships between them. For example, key points of attention should be to assure the quality of the outcomes for businesses that participate in teaching practices, and to canalize as many efforts and resources as possible, in order to meet the expectations of the stakeholders of a UBC-based teaching practice.

Nonetheless, meeting the expectations of business is not an easy task for academics in their role of educators and within the context of education. Their entrepreneurial and industrial experience plays an important role in determining a common understanding of the expected outcomes, however, levels of such experience vary among academics. Therefore, besides offering training to academics, it is in the interest of the university to ensure competent and knowledgeable staff to support educators and students in the delivery of quality outputs for business.

Similarly, as seen in chapter 5, academics vary in their networking practices, even under similar institutional environments and similar conditions, indeed, some academics might not have an external network of contacts with whom they can undertake UBC-based teaching

practices. Therefore, for these academics, networking within the university is crucial, since it will be their affordance to reach colleagues who might occupy bridging positions and hence provide them access to some external actors.

In conclusion, variances in the level of entrepreneurial and industrial experience among academics as well as in their networking practices and their self-efficacy in this respect, call for a greater emphasis on collaboration among academic peers within the university and for a collective approach towards fostering academic entrepreneurship within the university.

7.5.2 Limitations and Further Research Directions

The findings of this study are subject to a few limitations, which might be addressed by future research initiatives.

7.5.2.1 Limitations

A possible limitation of this study concerns self-reporting data collection with regards to the dependent variables of "academic entrepreneurship" in study 1 and "UBC-based teaching" in study 2, which may lead to biases. In future studies, researchers might consider developing a more objective measure for both dependent variables.

The self-selection of the sample filling in the online-based survey for the data used in studies 1 and 2 is also a methodological limitation of this research. Nonetheless, to minimize this limitation, answers were weighted to appropriately represent the number of academics and HEIs by country. For the same studies, the translation of the survey into 22 languages is a possible limitation, yet professional translators and back-and-forth translations were used in order to minimize it.

The case studies in study 3 were originally gathered in México and Western Europe, however one cannot draw any comparisons to identify similarities and differences between the networking practices of entrepreneurial educators in the countries. This is due to a smaller number of cases in Western Europe, compared to México. Therefore, the results from México are more representative.

Initially, the survey protocol used for the case studies in Chapter 5 included a section where the respondents could depict their ego-network (as seen in Appendix B). However, I experienced "respondents-dropout" in this section, which influenced the collection of the necessary data regarding their networking practices. For this chapter, I only have the respondents' perception of their network, but not a clear enough picture of their network to be able to conduct an ego-network analysis.

To fully comprehend and validate the effects of UBC-based education, several stakeholder groups need to be considered in the analysis. Chapter 6 however, attempted to capture the effects of UBC-based teaching by considering the students' perspective about the effects this form of teaching had on their skills and learning experiences. Since the data used in this study for chapter 6 was collected in the framework of a single setting and the benefits perceived by students regarding the effects of the UBC-based teaching practice on their skills were self-reported, our research in this respect suffers some limitations.

7.5.2.2 Further Research Directions

Based on the conducted research, the following further research directions can be given. First, the self-reporting data with respect to the dependent variables used in studies 1 and 2 call for further studies building on a more objective measure of academic entrepreneurship, taking as a basis the different entrepreneurial activities documented in the literature, either in the research or education domain.

The results from study 3 have shown a mediation effect of the self-efficacy of the academic in respect to her networking competency to undertake UBC activities. This mediation effect is highly significant but relatively small. Future studies should look to include other potential mediators in the model, in addition to the networking competency of the academic, mediators that reflect factors at the individual level.

The results of this dissertation have suggested that developing projects with business partners for teaching purposes could be considered a process whereby academics start or intensify their entrepreneurial engagements and develop certain entrepreneurial skills that help to establish a network of contacts with businesses. Further research would benefit from longitudinal approaches, observing the changes in the academics' perception of their self-efficacy with respect to their competencies to undertake UBC over time and observing if their own network develops over time, not only in size, but also in the strength of relationships.

Closely related to the aforementioned line of research, the topic of entrepreneurial networking presents a vast research area in general. Since the data in study 3 only looked at the entrepreneurial behaviour of entrepreneurial educators it is interesting to conduct an ego-network analysis to be able to map the actual network of the entrepreneurial educators and understand how different kinds of ties help to differing extents at each stage of the entrepreneurial process. Qualitative studies addressing the actual network of the entrepreneurial educator would enrich our knowledge in this respect. One could undertake several case studies in different national and organisational contexts (type of universities) to document whether different contexts have effects on the networking activities executed by entrepreneurial educators for the introduction of novelties in teaching. Qualitative studies with a case-base approach would enable the different perspectives of the stakeholders of the innovations in teaching to be captured, therefore giving a more complete picture of the phenomenon of UBC-based education.

7.6 **Conclusions**

Overall this dissertation sheds light onto the actual practice of entrepreneurship within universities. It approaches this stream of literature with the lenses of sociology, and in particular its sub-discipline, organisation theory. This sociological approach helped in understanding of academic entrepreneurship as a collective phenomenon, which recognises the actions of the individual academic entrepreneur (chapters 4 and 5), but simultaneously acknowledges the impact of the larger social system and institutional setting in which academic entrepreneurs are embedded, constraining or facilitating their entrepreneurial behaviour (chapters 3, 4 and 5). Even though entrepreneurship is often regarded "as a highly individualized behaviour", the studies in this dissertation have shown how academic entrepreneurial practices are subject to the broader context of UBC.

The discussion of whether individual or environmental aspects are more relevant in

explaining entrepreneurial behaviour among academics within the university context can be moderated and extended. Chapter 3 suggests that, in terms of providing complementary resources from business as well as a university mission that embraces UBC, the environment plays a significant role in determining the extent of academic entrepreneurial activity when manifested as the creation of spin-offs. Further, it suggests that the environment at regional and national levels could make key resources available for entrepreneurial activity. This argument is further supported by the low extent of academic entrepreneurial activity within the context of UBC in countries like Poland, where key resources for innovation are more deficient than in developed countries.

On the contrary, chapter 4 shows that when academic entrepreneurship is manifested in education activities, such as in UBC-based teaching that required less investment of resources, neither the structural component of the environment, nor the cognitive elements embracing a mission for UBC in the university played a significant role in the extent of entrepreneurial engagement of academics. However, relational aspects of the cooperation that are embodied in the individuals, such as existence of mutual trust, trustworthiness of the actors, existence of a shared goal and mutual commitment of both actors, played a significant role; with the perceptions at the personal level, such as self-efficacy, playing a highly significant role in explaining the extent of development of UBC-based teaching.

A social cognitive theory (Bandura, 1988, 1989) and field theory (Lewin, 1951) approach in chapter 4 helped to moderate this debate by positioning the perceptions of the individuals at the front end, explaining that it is a matter of the subjective perceptions of the academics about their environment and their own competencies that will determine their entrepreneurial behaviour (Bandura, 1989-1997). Entrepreneurial behaviour is not only a result of the personal and professional attributes of academic entrepreneurs, nor is it only subject to the institutional arrangements and structures of the university. Instead, it is a triadic, dynamic, and reciprocal interaction of personal factors and the environment (Bandura, 1988, 1997). Academics are embedded in their environment and their perceptions about it will determine their behaviour, but so too will individual perceptions of their own abilities.

On the basis of this central argument, the answer to my main research question of *How do the social interactions of academics affect their entrepreneurial behaviour within the context of UBC-based education and (if any) with what effects on the education mission of the university?* is two-fold. Firstly, the answer to the first part of the question of *How do the social interactions of academics affect their entrepreneurial behaviour within the context of UBC-based education,* is*:*

The social interactions of the academic create a networked context of cooperation, in this case a UBC context. When the academic entrepreneur is acting within the context of UBC, the perception of UBC as an environment of interaction becomes the life-space (Lewin, 1946, 1951) of the academic, where positive (drivers) and negative (barriers) forces exert influence on the academic to undertake entrepreneurial endeavours. The positive and negative forces are only perceived by each individual academic entrepreneur, and based on these perceptions, their behaviour will be shaped by the negative (barriers) or positive (drivers) forces.

On the basis of the overall results from this dissertation, it could be argued that academics need to perceive a context of trust, where both parties involved share a common goal and invest time in constant communication. This is to say, that they need to perceive a context where relational capital is high, in order to engage in entrepreneurial endeavours. However,

they also need to perceive the necessary resources to exploit opportunities as attainable, therefore, academics embedded in trusted networks will be more likely to engage in entrepreneurial endeavours.

However, environmental and personal aspects interact in a reciprocal manner where the environment causes entrepreneurial behaviour, but also entrepreneurial behaviour of academics causes the environment. Therefore, academics are reflective agents who endogenously decide on, and are practitioners of networking practices that shape their collaborations and ultimately their social capital.

Academics' behavioural aspects at the individual level, such as their self-efficacy to network and their actual networking behaviour, will determine the successful configuration of their networks and their social capital for the attainment of entrepreneurial goals within the context of the university. Adding to these behavioural characteristics at the individual level, "experience in the opposite non-academic environment" represents an "affordance" for academic entrepreneurs to configure strong and trusted networks with business, since it bridges the cognitive and relational proximity with them.

Therefore, academics are strategic actors who can create a context where relational social capital is high, and at the same time, this context will be perceived as a life-space where positive forces predominate, which will encourage the engagement of academics in entrepreneurial endeavours.

With respect to the answer to the second part of the research question of *what are the effects of the social interactions of academics and their entrepreneurial behaviour on the education mission of the university?*, the answer is focused on the consequences of their entrepreneurial behaviour within the context of UBC-based education, therefore, the answer to this part of the question is:

The entrepreneurial behaviour of academics creates new learning environments for students through a learning network created by UBC-based teaching. A UBC-based form of teaching becomes a network of learning, where different members of that network engage in a knowledge circulation process. From a social constructivist view on human cognition (Jonassen, 2009), the results indicate that learning also depends on social interactions, not only between instructors and classmates, but also among the actors in the learner's socio-economic context, providing a source of expertise and experience from the world of work (Pugalis & Liddle, 2014). The findings therefore support the notion that academic entrepreneurship is not merely an economic process but draws from the social and institutional contexts that shape entrepreneurial behaviours, processes and outcomes (Jack & Anderson, 2002; Welter, 2011). In the same vein, the outcomes are not merely economic, but are also of a social nature creating value for the communities that are involved in this process, such as the students and the business.

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Appendix A. Measurement of variables and factor loadings corresponding to Chapter 4

Conditions related to structural social capital *Determinant (.289); KMO (.729); Bartlett's (.000); Cronbach's α = .780*	Loadings
▪ UBC activities aimed at academics to interact with business people	.840
▪ UBC activities aimed at students to interact with business people	.696
▪ Offices and personnel dedicated to UBC (incl. technology transfer office, incubator, career office)	.853
▪ University resources (e.g. buildings, founding, equipment)	.720
Conditions related to cognitive social capital ***Determinant (.258); KMO (.700); Bartlett's (.000); Cronbach's α = .731***	
▪ Commercial orientation of the university (which is expected to be part of a common understanding with business)	.388
▪ A university mission, vision, plans and communication embracing UBC	.812
▪ National/Regional policies on education supporting UBC	.874
▪ National/Regional policies on research supporting UBC	.885
Conditions related to relational social capital ***Determinant (.264); KMO (.770); Bartlett's (.000); Cronbach's α = .776***	
▪ Existence of mutual trust	.858
▪ Existence of mutual commitment (trustworthiness of the actors)	.860
▪ Prior relation with the business partner	.585
▪ Existence of a shared goal	.817
Networking competency of the academic ***Determinant (.198); KMO (.740); Bartlett's (.000); Cronbach's α = .789***	
▪ I have sufficient knowledge of what business need and want	.790
▪ I have sufficient skills and knowledge of UBC generally (including the procedures and processes)	.776
▪ I have a lot to offer to business in education and training	.606
▪ I have a lot to offer to business in research	.708
▪ I have the capability to transfer / exchange knowledge and technology to / with business	.809

Appendix B. Interview protocol corresponding to Chapter 5

Networking for the execution of novelties in teaching in cooperation with external actors within the context of the university

Main information

Name of the programme: _____

Name of the course: _____

Name of the specific teaching practice: _____

Name of the academic: _____

Date and time of the interview: _____

Structure of the interview

- Explanation about the content or the interview:
- Introduction
- Data collection
    - The academic
    - The teaching practice
    - The organising process of the teaching practice and its network
    - Networking behaviour of the educator
    - Benefits perceived

        - *You may stop the interview at any moment and we can reschedule a new date for the conclusion of the interview.*
- Conclusion

Introduction to the study

In this study, we attempt to understand your networking behaviour, and how this has affected your entrepreneurial behaviour within the university. To achieve this objective, we look at your "teaching practice" in order to frame the empirical context of these behaviours. We look at this phenomenon from five dimensions:

1) Individual academic
2) The teaching practice
3) The entrepreneurial process of organising the teaching practice
4) The network of the specific teaching practice
5) The networking behaviour of the academic

Data collection

First of all I would like to ask you to introduce yourself. I will guide you through this interview with some questions:

The academic:

Academic profile:

i. What is your age?
ii. Where are you from?
iii. What is your education background? Higher academic level of attainment?
iv. How long have your been working in the university?
v. In which faculty do you work?
vi. Which courses do you teach?
vii. Do you think that your academic peers think of you as an innovative academic?

Entrepreneurial profile:

i. Do you have any work experience in the industry? If so, what kind of experience and for approx. How many years?
ii. Have you started new business ventures outside the university? If so, how many? Are these successful (or have they been)? Are they related to your research focus or the work you do in the university?
iii. Are you currently involved in the creation of other organisations within or outside the university? If so, what type of organisations?
iv. (If yes to the previous three questions) Do you think that your academic peers think of you more as an entrepreneur (one who creates new organisations) or more as an academic?

The teaching practice:

i. Describe the teaching course in detail.
ii. What is the nature of collaborative efforts with external actors that has been needed to execute the teaching course?
iii. How did the idea of the teaching course start?
iv. Was there a planning process, and how did it work? What were the original goals of the teaching course?
v. In what ways is the teaching course innovative compared to other teaching courses in the same discipline?
vi. How is the teaching practice perceived by the main stakeholders (Students, academic peers, academic management of the university, external actors participating in such teaching courses)?

The entrepreneurial process of organising the teaching practice

Opportunity recognition

i. How did the teaching practice start?

ii. Were you alone or was it organized by other academics as well?

iii. Can you mention the most important people (max. Five) inside and/or outside your organisation that provided you with ***professional advice*** to successfully implement this *teaching practice?*

Opportunity development and exploitation

i. *Garnering resources*

a. Can you mention the most important people (max. Five) inside and/or outside your organisation who currently play a key role in the ***daily operation*** of this *teaching practice?*

b. Where do you meet the external actors that participate in your teaching practice?

c. Can you mention (the most important people (max. Five) inside and/or outside your organisation that you contact when you need ***resources*** (time availability, financial resources, rooms in the university, certain information, etc.) For the implementation of your *teaching practice?*

d. Can you mention the most important people (max. Five) inside and/or outside your organisation who ***encourage you*** to try new things in your *teaching practices* or who ***support you emotionally*** when you want to try *new practices in teaching?*

e. Is there anyone elsewho is important for the successful implementation of your teaching venture, that does not fit into the previously mentioned categories?

ii. *Gaining legitimacy*

a. According to you, what are the biggest challenges in keeping *this kind of teaching practice* in the university where external actors are involved?

b. Do you think that your *teaching practice* has a logical place within the current priorities of your university? If so, can you elaborate further on your response?

c. Who do you think are the main stakeholders in this *teaching practice*? Is it easy to convince the main stakeholders of this teaching practice to participate in it?

d. How do you perceive the support you receive for the implementation of this *teaching practice* from the following actors and in which ways do they offer you support?:

- Your academic dean
- Your immediate supervisor, director of the department where you work
- Your colleagues
- The university board
- External partners participating in the teaching practice

The networking behaviour of the entrepreneurial educator

Now I would like to know more about your *Networking activities* within the context of the professional life:

i. What is "networking" for you?
ii. Do you think that "networking" with actors **within** your university is important? Why?
iii. Do you think that "networking" with actors **outside** your university is important? Why?

Now, I would like to know more about the different mechanisms implemented in your networking activities.

Building your network:

i. Are you consciously looking for new contacts to expand your social network?
ii. Are you someone who establishes network contacts on the basis of personal affection and similarities or is it a more conscious assessment of how you actually benefit from your contacts (cf. Acquire knowledge, advice, opportunities, support and referrals, etc.)?
iii. In your perception, how does networking usually start in your case? Do you usually make the first approach, or do you think that people usually approach you first?

Maintaining your network:

i. Can you mention five examples of ways in which you keep in touch with your contacts in your professional sphere?

Exposure routines:

i. Do you use social media? If so, what kind of social media? (e.g. Linkedin, Research Gate, Facebook, Twitter; Xing, etc…). For which purposes?
ii. Do you have a profile page in the website of the university? What do you mention there?
iii. Do you usually attend academic conferences? If so, for which purposes?
iv. Do you write in blogs?
v. If you meet new contacts, do you usually give your business card to them without them asking for it, or do you only give it away if they ask for it?

Now, thinking of your teaching practices…

Network-building mechanisms

i. How do you usually meet the external partners that will participate in the *teaching practice?*
ii. How do you usually approach them? Have you met them before? How long ago?
iii. Who introduced them to you?

iv. How do you select them?

Network-maintaining mechanisms

i. Can you please tell me how you keep in touch with the external actors that participate in the teaching practice?
ii. How often do you see / communicate with them during the *teaching practice*?

Exposure routines:

i. Do you have a website for your teaching practice? If so, for which purposes?
ii. What would you regard as the main event where your teaching practice has exposure to the public?
iii. Who do you invite to these events? What kind of contacts are they?
iv. How do you disseminate or promote this teaching practice to the public?
v. Do you consider your teaching practice to be an innovation in teaching?
vi. Have you written articles about this teaching practice?

Benefits perceived / perception on new value creation

Benefits for the main stakeholders of the teaching practice

Think of the main actors involved in your *teaching practice*, such as:

a) Students
b) Academic colleagues
c) Industry contacts
d) Actors external to the university (e.g. Government, non-profit organisations)
e) The university as a whole

i. Why (do you think) they want to participate in this *teaching practice?*
ii. Do you think that your *teaching practice* has a logical place within the current priorities of your region in higher education? If so, can you elaborate further on your response?

Benefits for the academic

i. Why do you do these *teaching practices?*
ii. Have you learned something new by doing these *teaching practices*? If so, what?
iii. What has it done to your professional profile?
iv. Would you continue doing these *teaching practices*?

Synergistic effects between the academic tasks of the entrepreneurial educator

i. Is there any relationship between these *teaching practices* and your research activities?
ii. Do you think that these kind of *teaching practices*, where you incorporate external actors, are important for the so-called – "third

mission of the university" – understood as knowledge transfer to the industry, and society as a whole? Why?

Conclusion

i. What do you think about interview?
ii. Are the topics of this interview issues that you yourself usually think about?

Thank you very much for this interview.

Appendix C. A brief description of the cases in Chapter 5

The European Cases

Academic A, from Europe, with a PhD and an educational background in business administration, is the academic behind the course on Entrepreneurship. She is currently starting her own business, focused on providing consulting for entrepreneurs. She took over an existing course but has built her own network of entrepreneurs for the teaching practice. She has also added new materials and topics that were not there before. Students are expected to learn what it entails to pass through the process of entrepreneurship, even though they are not necessarily expected to become entrepreneurs themselves. Real entrepreneurs offer the students a real challenge from their companies. Students are expected to develop a business plan, related to the launch of a new product or entry to a new market. The academic brings the students and entrepreneurs together, but subsequently students take charge of maintaining the contact with the partner organisation. Business plans are presented to the entrepreneurs in the university at the end of the course in a specific event.

Academic B, from Europe, with a PhD and an educational background in marketing and IT, is the academic behind the course on Entrepreneurship Development of Business Ideas. He is a business owner. He started a course inspired by a previous one created by one of his colleagues. For this course, he has built a network of external actors along with his peers. The course has been running for two semesters with great success from the students' side and has attracted attention from the regional media. Students are expected to develop their own business ideas and present them in a "*three-minute pitch format"* to real entrepreneurs in a final public event. The innovation in teaching is the practical approach, which stimulates interaction between the students and the outside world. It introduces a new way of presenting business ideas to real entrepreneurs, and offers students the chance to develop the crucial skill of presenting information as a proper speech in limited time. The course also offers an innovation in terms of the evaluation. At the end of the course there are two winners - one from among the real entrepreneurs and the other from the auditorium. The entrepreneurs, as well as the audience, can invest virtual money in the different business ideas. At the end, students receive an evaluation, not only from the academic, but also from experts in the field and from the audience that could resemble a market. Key actors from the entrepreneurial ecosystem of the region are also brought together in this final public event, which stimulates the creation of networks for entrepreneurship education. Invitees include people from the chambers of commerce, from the regional development agencies, from start-ups and from corporate venture units. This approach is a departure from the traditional lecturing model in universities in Germany.

Academic C, from Europe, with a PhD and an educational background in marketing is the academic behind the course on Marketing. He has been involved in the creation of many organisations. He is currently working in many consulting projects for companies and research projects for the European Commission. He has created many innovations within the university, such as the creation of his own research unit. Throughout this course he achieves synergies among his research and teaching duties, as well as maintaining his responsibility of transferring knowledge to business. He created the course in 1992 and is still executing it successfully. Many publications around his teaching practice support this premise as an

effective approach towards developing entrepreneurial behaviour among students. Students are expected to deliver a final project for companies of the region based on a real business challenge. He is in charge of acquiring the projects from businesses in the region. He established the contacts and follows the relationship throughout the course. Students meet with business owners or directors at the beginning of the course and then again at the end, during a presentation in the company's facilities. The innovation in teaching is that students gain real experience from a real project from a real company. Students work in a multicultural environment with students from different backgrounds. The evaluation of the course also represents an innovation, as it is not only concerned with the achievement of a good grade. Instead, as the companies are paying real money for the projects, students need to deliver something real and of a high quality, that can fit into the strategy of the company. The company certifies this project, and at the end, issues students with an official certificate of participation,.

The Mexican Cases

Academic D, from México, with two PhDs in business and management science is the academic behind the course on Family Business. She has created her own business on jewellery. Her course is different from the others in the sense that there is no group. The innovation in the course is an individualised mentoring approach to entrepreneurship. She works with the students individually, one-and-a-half hours every week. Although she has not implemented this innovation, she is considered to be an entrepreneurial academic because she is responsible for the development of the projects of the students who need to graduate with a company that has some production and some revenues. It is a big burden on the shoulders of any academic to have a goal such as this on a university course. She is also responsible for putting students in contact with real entrepreneurs, who will mentor them in the creation of their companies. She selects the entrepreneurs according to the profiles of the companies of the students.

Academic E, from México, with an educational background in economics is the academic behind the course on Social Entrepreneurship. She has worked on consulting projects for companies as an academic. She is currently working on projects with students and companies at the base of the pyramid, or micro enterprises. The innovation introduced by her is the work with those kinds of companies. Most of the courses were focused on working with high technology companies, but she decided to have a course where students could work with these kind of companies at the base of the Pyramid (BOP) (). The main objective of the course is to develop empathy among students about the reality in Mexico since more than 90% of the companies are smes and many of them are in fact micro enterprises. Students help entrepreneurs to innovate their processes and perform a whole plan for them. Sometimes the students establish the contact with the companies and sometimes she does it. She tries to be with the students in key meetings with the entrepreneurs in order to establish trust and credibility.

Academic F, from México, with an educational background in Business, a master's degree in Engineering and currently a PhD Student is the academic behind the course on Business incubation. She is currently working with students who are willing to develop their own companies in order to graduate. External actors judge their companies in a final event, or help as mentors for the students as well. The innovation in the course is an individualised mentoring approach to entrepreneurship, where she mentors students on a one-to-one basis. Students are also in personal mentoring sessions with real entrepreneurs. Beyond teaching her

course, she is the academic director of the Entrepreneurship and Innovation department and is in charge of selecting the people to teach courses in the entrepreneurship domain. She is also responsible for establishing a network of contacts with external actors, in order to teach in cooperation with them. She has implemented a process to be able to connect with external actors, bringing key people with practical experience from the outside world to teach the courses on entrepreneurship.

Academic G, from México with an educational background in International Business is the academic behind the course on Innovation, Markets and Technology. He has his own company and has previously worked in industry. The innovation that he implemented was about setting micro cases with companies. Six companies were invited to fill out a small formula with a real challenge from their company to be solved by the students during the semester. At the end of the semester, the representatives of the companies evaluate and validate the ideas of the students. He tries to create a balance between the theory and the external practical world in order to solve the challenges. Besides the courses that he teaches, he is known by his peers as being the one who usually brings a network of external actors together for teaching purposes, either for his classes or for other courses and events.

Academic H, from Brazil, living in Mexico, with an educational background in marketing and advertising is the academic behind the course on Development of enterprises with high social impact. She is currently working at the ministry of innovation, coordinating the social entrepreneurship area. She works in the university as academic lecturer and coordinator of the social entrepreneurship courses. Within the context of her teaching practice, she mentors students throughout the development of their business plans for social enterprises. Two main changes in the course constitute the innovation on teaching. First, she offers an individualised mentoring approach to students throughout the development of their business plans. This individualised mentoring can be executed by her or by real entrepreneurs in the social sector. Second, real entrepreneurs in the social sectors are constantly invited to expose real cases and present some topics in the curricula.

Appendix D. Additional academic and professional outreach

Books

Baaken, T., & Rossano-Rivero, S. (2016). *Entrepreneurship in Latin America*, Berlin, buchdruck.de, ISBN: 978-3-938137-83-3.

Badillo-Vega, R., Galán-Muros, V., Raesfeld, L., Baaken, T., Rossano-Rivero, S., & Villarreal-Castro, M. (2015). *Change to Success: Case Studies of Latin American Universities on Solutions for Promoting Innovation in Knowledge and Technology Transfer*, Münster: Waxmannn,

Peer-reviewed journal papers

Rossano-Rivero, S., & Wakkee, I.A.M. (2018). Academic entrepreneurship in the context of education: the role of the networking behaviour of academics. *Journal of Science and Technology Policy Management*, https://doi.org/10.1108/JSTPM-03-2018-0034.

Baaken, T., Rossano, S., Von Hagen, F., Davey, T., & Meerman, A. (2016). University-Business Cooperation and entrepreneurship at universities – An empirical based comparison of Poland and Germany, *Optimum. Studia Ekonomiczne*, 77(5), 3-26.

Davey, T., Rossano, S., & van der Sijde, P. (2016). Does context matter in academic entrepreneurship? The role of barriers and drivers in the regional and national context. *The Journal of Technology Transfer*, 41(6), 1457-1482.

Rossano, S., Meerman, A., Kesting, T., & Baaken, T. (2016). The relevance of problem-based learning for policy development in University-Business Cooperation. *European Journal of Education*, 51(1), 40-55

Book chapters

Baaken, T., & Rossano, S. (2017). Die Wirtschaft als Partner für Bildungsprojekte: Die Integration von Projekten mit Unternehmen in die Lehre. In H. Sylvester (Ed.), *Europa in Bewegung* (pp. 176–180). Bonn: DAAD

Baaken, T., Davey, T., & Rossano, S. (2016). Marketing - Making a Difference for Entrepreneurial Universities. In: Plewa, C., & Conduit, J. (Eds.), *Making a Difference Through Marketing - A Quest for Diverse Perspectives* (pp. 247-265). Singapore: Springer Science and Media.

Baaken, T., Kiel, B., Rossano, S., Baaken, M., & Maas, G. (2016). Competencies in Entrepreneurship – Teaching Entrepreneurship in Higher Education from a new angle. In: Saíz, M. J. (ed.): *Handbook of Research on Social Entrepreneurship and Solidarity Economics*, New York: IGI. Pp. 154-173.

Rossano, S., & Baaken, T. (2016). Entrepreneurship in Latin America: A closer look to alternative approaches to foster innovation and entrepreneurship in the region. In: Baaken, T.; Rossano, S. (eds): *Entrepreneurship in Latin America*, Science-to-Business Marketing, Münster, pp. 13-21.

Baaken, T., & Rossano, S. (2016). Academic Entrepreneurship: A Science-to-Business Marketing Perspective. In: Badillo-Vega, R., Raesfeld, L., Pineda Olivieri, J., & Galán-Muros V. (eds): *Knowledge and Technology Transfer in Mexico and Germany*, Mexico: GET-IN 2015, Universidad Autónoma del Estado de Hidalgo, pp.99-115.

Rossano, S., Baaken, T., & Badillo-Vega, R. (2015). Issues in Knowledge and Technology Transfer in Latin America, in: Badillo-Vega, R., Galán-Muros, V., Raesfeld, L., Baaken, T., Rossano-Rivero, S., & Villarreal-Castro, M. (eds): *Change to Success - Case Studies of Latin American Universities on solutions for promoting innovation in knowledge and technology transfer*, Münster: Waxmann, , pp: 23-33.

Conference papers

Rossano, S., & Wakkee, I. (2017). Educators as Academic Intrapreneurs: An entrepreneurial social networking perspective. University-Industry Interaction (UIIN) Conference 2017, Dublin, IE.

Rossano, S., & Mcluskie, P. (2016). Soft e-leadership skills, hard learning in Europe. EAIE Conference 2016, Liverpool, UK.

Rossano, S., Kesting, T., & Wakkee, I. (2016). The role of networking style of academics with respect to their entrepreneurial behaviour. University-Industry Interaction (UIIN) Conference 2016, Amsterdam, NL.

Davey, T., Rossano, S., & van der Sijde, P. (2015). Academic entrepreneurs see things differently - An analysis of barriers, drivers and incentives facing European academic entrepreneurs. University-Industry Interaction (UIIN) Conference 2015, Berlin, GER.

Rossano, S., Meerman, A., Kesting, T., & Baaken, T. (2015). University-business Cooperation in Advanced Problem-Based Learning: Developing transversal skills among undergraduate students, HTSF Conference on Technology Based Entrepreneurship, Groningen, NL.

Rossano, S. (2014). Academic Intrapreneurship as an Antecedent for Academic Entrepreneurship, Science-to-Business Marketing Conference, Zürich, CH.

Summary in English

Entrepreneurial behaviour of academics within the context of education

This research investigates the entrepreneurial behaviour of academics. Nowadays, universities are expected to be organisations with open boundaries, allowing for the cooperation and interdependency among different actors in the society. Against this background, this research focuses on the engagement of academics on entrepreneurial activities with external actors, so as to introduce novelties in teaching to create value for the university.

Social capital theory on entrepreneurship explains how social structures facilitate and constrain opportunities, behaviours, and cognitions of social actors. However, we know less about the actions of individuals to organize their social network in the first place. This contributes to this theory by focusing on the individual characteristics, such as networking practices of academics, as antecedents of social capital organisation.

Additionally, this research provides societal contribution by accomplishing a better understanding of the possible synergies between the three core tasks of the university (teaching, research and knowledge transfer).

This research follows a sequential mixed methods approach grounded in critical realism. Four studies are conducted to understand *How do the social interactions of academics affect their entrepreneurial behaviour within the context of UBC-based education, and (if any) with what effects on the education mission of the university?*

Study 1: Does context matter in academic entrepreneurship? The role of barriers and drivers in the regional and national context

With pressure on universities to better contribute to society, academic entrepreneurship is an increasingly recognised source of new knowledge and technologies as well as being a driver of the movement to a knowledge society. However, whilst growing, the level of academic entrepreneurship in Europe is still relatively low.

Two factors influencing this are inhibitors (barriers) and facilitators (drivers), however the understanding of how their interplay influences academic entrepreneurship, particularly across different contexts, is lacking.

For this reason, this study focussed on two environmental settings, European regions and countries, seeking to understand if it is the hurdle (barrier) or (and/or) tail-wind (drivers) that most impacts academic entrepreneurship and how the regional or national context influences this.

An online survey was translated into 22 languages and undertaken in 33 countries in Europe and the European Economic Area. From the original data set, 12 countries in four European regions provided a sample of 2925 responses, with a second step to focus on four ‘lead’ countries within those regions.

The results show that there is a significant difference in the university-business cooperation barriers and drivers that affect academic entrepreneurship in the European regions. Furthermore, different barriers and drivers were found to significantly affect the four lead countries with barriers and drivers being able to provide a good explanation of the extent of academic entrepreneurship in the UK and Germany, and a more limited explanation of

entrepreneurial activity by Spanish and Polish academics. Overall the article contributes to the literature of resource-based theory and also the understanding of factors influencing European academic entrepreneurship.

Study 2: The role of the networking competency of the academics in university-business cooperation within the context of education: An integration of social capital and social cognitive theories

Perceptions of academics with respect to their networking competency to handle University-Business Cooperation (UBC) activities, has received limited attention in the context of their teaching practices executed with business. This paper addresses this research gap by examining the role of the networking competency of the academic entrepreneur in UBC-based education, from a sociological perspective. We contribute to existing research by combining literature streams from the fields of academic entrepreneurship, UBC, social capital and social cognitive theory, to understand how and to what extent the perceptions of academics about their social capital and their self-efficacy with respect to their networking behaviour, affect the extent of development of UBC-based teaching. To answer the research question, a conceptual model grounded in social capital and social cognitive theories was developed. It was used to test how academics' perceptions about their immediate social environment influence them in engaging in UBC-based teaching. We also considered the role of the self-efficacy of the academic in this relationship, with respect to his or her networking competency. The empirical research is based on a survey implemented to academics in Germany. The final data set used for this study includes a total of 312 responses valid for analysis. Through a series of regression analyses and mediation analyses the findings of this paper highlight the importance of relational capital for academics in their role of educators, as well as the importance of their self-efficacy in respect to their networking competency to handle UBC-based teaching practices. Implications of the findings for entrepreneurship educators and university management are ultimately discussed along with suggestions for further research.

Study 3: Academic entrepreneurship in the context of education: the role of the networking behaviour of academics

This qualitative study extends literature on academic entrepreneurship and entrepreneurial networking by examining how academics, in their role of entrepreneurial educators, network for the creation and execution of novel teaching practices in cooperation with external actors. Considering evidence from eight case studies conducted in Mexico we found that the networking behaviour of entrepreneurial educators is crucial for the generation of proximity with external actors and for the acquisition of key resources, such as an external actor, to participate in teaching practice and for the generation of legitimacy for their innovations in teaching. The entrepreneurial and industrial experience of entrepreneurial educators emerges as an affordance to network with external actors, helping them to achieve a common understanding of the opportunity and to generate trust among them. This study equips managers of higher education institutions with critical insights into innovating the teaching mission of the university and developing closer and stronger relationships with external actors of the university. The propositions presented in this study regarding the different networking actions of the entrepreneurial educators uncover notable theoretical and managerial implications and offer some key research directions.

Study 4: The relevance of problem-based learning for policy development in University-Business Cooperation

Most prior research on academic entrepreneurship focuses on the interplay between university research and technology transfer activities in the form of joint research, spinoffs, licensing and patenting. Yet there still remain questions with respect to the role of academic entrepreneurship in education and learning. Lifelong learning has been developing into one of the top priorities for many higher education institutions, with a greater emphasis on developing transversal skills, including entrepreneurship. One approach to developing transversal skills through education, which is adopted increasingly, is through problem-based learning (PBL). PBL shifts the focus from teacher-driven education to student-centred learning involving active participation of learners. By taking the students' perspective, this paper presents the effects of PBL in the context of university-business cooperation (UBC), on the development of student's transversal skills. According to our findings UBC-based PBL has an effect on the interpersonal skills of students, such as teamwork and communication, and turns out to be a promising approach with regard to entrepreneurship education and paving the way for long-term and more intense UBC activities.

Overall this dissertation sheds light into the actual practice of entrepreneurship within universities. It approaches to this stream of literature with the lenses of sociology, and in particular its sub-discipline, organization theory. This sociological approach helped in the understating of academic entrepreneurship as a collective phenomenon, which recognizes the actions of the individual academic entrepreneur (Chapters 4 and 5), but simultaneously acknowledges the impact of the larger social system and institutional setting in which academic entrepreneurs are embedded, constraining or facilitating their entrepreneurial behaviour (Chapters 3, 4 and 5). Even though entrepreneurship is often regarded "as a highly individualized behaviour", the studies in this dissertation, have shown how academic entrepreneurial practices are subject to the broader context of UBC.

On the basis of the overall results from this dissertation, it could be argued that that academics need to perceive a context of trust where both parties involved share a common goal and invest time in constant communication. This is to say, that they need to perceive a context where relational capital is high in order to engage in entrepreneurial endeavours. However, they also need to perceive the necessary resources to exploit opportunities as attainable, therefore, academics embedded in trusted networks, will be more likely to engage in entrepreneurial endeavours.

However, environmental and personal aspects interact in a reciprocal manner where the environment causes entrepreneurial behaviour, but also entrepreneurial behaviour of academics causes the environment. Therefore, academics are reflective agents who endogenously decide on, and are practitioners of networking practices that shape their collaborations and at the end their social capital.

Behavioural aspects at the individual level, such as their self-efficacy to network and their actual networking behaviour will determine the successful configuration of their networks and their social capital for the attainment of entrepreneurial goals within the context of the university. Adding to these behavioural characteristics at the individual level, "experience in the opposite environment" represents an "Affordance" for academic entrepreneurs to configure strong and trusted networks with business since it bridges the cognitive and relational proximity with them.

Therefore, academics are strategic actors that can create a context where relational social capital is high, and at the same time, this context will be perceived as a life-space where positive forces predominate, which will encourage the engagement of academics in entrepreneurial endeavours.

The entrepreneurial behaviour of academics creates new learning environments for students through a learning network created by UBC-based teaching. In this contribution, the outcomes are not merely economic, but are also of a social nature creating value for the communities that are involved in this process, such as the students and the business. A UBC-based form of teaching, becomes a network of learning where different members of that network engage in a knowledge circulation process. From a social constructivist view on human cognition, the results indicate that learning also depends on social interactions, not only between instructors and classmates, but also among the actors in the learner's socio-economic context, providing a source of expertise and experience from the world of work. The findings therefore support the notion that academic entrepreneurship is not merely an economic process but draws from the social and institutional contexts that shape entrepreneurial behaviours, processes and outcomes. In the same vein, the outcomes are not merely economic, but are also of a social nature creating value for the communities that are involved in this process.

About the Author

Sue Rossano-Rivero from Mexico City is currently a researcher at the Science-to-Business Marketing Research centre from Münster University of Applied Sciences (MUAS) in Germany, and a lecturer in Marketing at the faculty of economics at MUAS. She develops and coordinates research projects based on knowledge alliances between the industry and the university within Europe and the Latin American region.

Since her arrival to the Science-to-Business Marketing Research centre in 2014 she has carried out several research projects, which were funded by international funding bodies such as European Commission, the German Academic exchange Service (DAAD), and the University Rectors' Conference (HRK). Her contribution to these projects varied from applying for funding, collecting and analysing data to writing project reports. During the last 4 years, her contribution in proposal writing secured third-party funding worth a total of approximately €306,271.00.

She is an advocate of University-Business Cooperation (UBC) as she truly believes in the positive synergies between UBC and the enhancement of research and teaching (learning) activities within the university. Currently, she establishes relations with companies in the region to incorporate cooperative projects into her classes and give the students real learning experiences in business and entrepreneurship.

At the beginning of 2018 she was assigned a *"Junior-Professorship"* position at MUAS, which entitles a post-doc three-year programme to develop her profile as academic and scientist, while working 50% for a company to further develop her industrial profile.

Sue holds a Bachelor degree from Northwood University in Michigan (USA) on International business and economics, and a master's degree in Electronic Commerce from the Graduate School of Business at Tec de Monterrey (México).

Sue is a passionate and devoted mother and wife, as well as competitive tennis player and runner. Together with her husband and her son she lives in Senden, Germany since 2012.